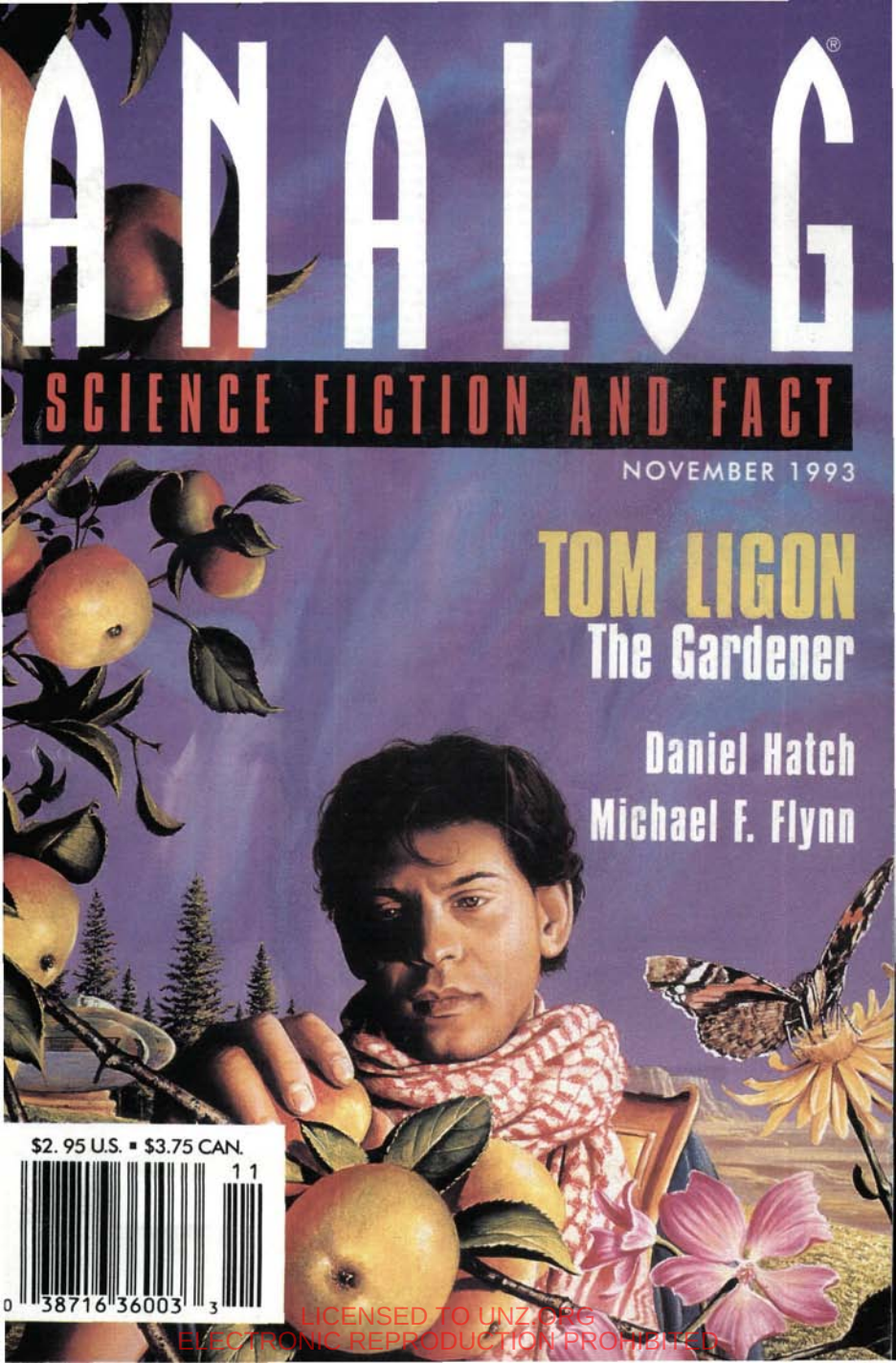

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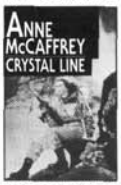

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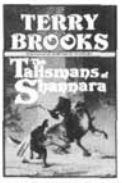

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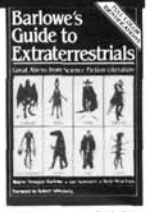

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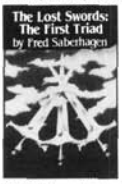

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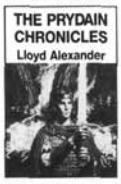

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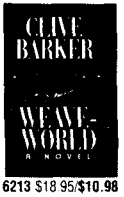

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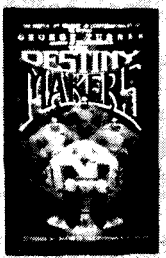

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EDITORIAL Stanley Schmidt

MAMA KNOWS BEST

Debates over environmental pollution, like those on most issues that people consider important, tend to be between emotionally charged extremes rather than well-reasoned opinions. People for whom preservation of the "natural" condition has become an overriding concern often lack the patience to look at the actual impact when someone wants to change that condition. Others, captivated by the huge potentials of technology for improving human life, may be just as cavalier in dismissing concerns about the side effects that come with the benefits. The few who really want to consider carefully what both sides have to say are caught in the middle. *Neither* side wants to be bothered with listening to them, or explaining its own viewpoint rigorously enough to help anybody make an objective evaluation. Both are too busy taking potshots at each other.

Which is unfortunate, because such potshots too often lead to ill-conceived and ill-considered actions—by *both* sides. Having become aware of the existence of environmental dangers, some people (particularly in periods when Environmentalism is Fashionable) go into hysterics and demand actions that may or may not be reasonable in view of actual numbers. (*Warning: Read this essay all the way through before reacting to any part of it!*) They may think every kind of pollution should be reduced to *zero*, which in many cases is neither possible nor worthwhile. The environment naturally contains a little of just about *everything*. If the amount of a substance is small enough, it may have no effect significant enough to warrant the effort of getting rid of it. Yet the effort is demanded, and governments trying to keep most of their constituents at least a little bit happy are led into ludicrous combinations of actions.

As I write this, for example, New York State and the federal government are haggling over how to bring southeastern New York into compliance with the Clean Air Act of 1990. They're seriously considering banning such trivial pollution sources as backyard barbecues, while refusing to implement demonstrated means of

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reducing pollution from the area's most important source, the automobile. Such efforts as *are* directed at cars include impractical restrictions on their use which would be unnecessary if vehicles were required (as they could be) to run cleaner. At least one environmental group is trying to get the same extreme measures imposed on a county that already has clean air as on another that may actually need them.

If a few fanatical environmentalists make excessive and unreasonable demands, and pressure governments into acting on them, a predictable and unfortunate result is a backlash against *all* environmentalists. Ultimately such a backlash could hurt the environmental movement badly, by goading people into throwing out the baby with the bath water—opposing even reasonable and urgently needed environmental measures along with the extreme and useless.

But that works both ways.

It's true, as G. Harry Stine points out elsewhere in this issue, that humans have long demonstrated a pretty good ability to deal with their own wastes. The fact that pollution problems are often visible doesn't mean that we're intrinsically incapable of dealing with them, but only that we've outgrown the old solutions. The problems we see are the ones we haven't had to solve before. When the things that worked yesterday are no longer adequate for the way we live today, we notice something bad happening. Then we have to learn new tricks to cure that badness.

Our ancestors have done that many times before; our descendants will have to do it again many times in the future. The fact that problems are all around us doesn't necessarily mean that the end of the world is at hand and we must wring our hands in despair. More often (by definition!) it simply means there is still work for professional problem solvers to do.

It's also true that we're probably not presently capable of destroying the world, in a literal sense, or even making it uninhabitable; and that no nations or leaders have yet done even as much damage as they *are* capable of.

However . . .

There's a real danger in being too cavalier about our abilities to do damage. Certainly many people need to be reminded that the Universe, or even the Earth, is a very large, resil-

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ient system which can withstand a considerable amount of abuse and can usually strike a new balance when an old one is disturbed. But there are several points that need to be kept in mind while trying to develop this more realistic perspective.

First, even if it is true that we're incapable of rendering the whole planet uninhabitable, that fact hardly warrants acting as if it doesn't much matter what we do because its consequences will be globally insignificant. People don't live globally; they live locally. They do need to be concerned about what they're doing to the places where they live. Since a significant change in conditions in one place can affect those elsewhere (for example, increasing rainfall in one county may cause a drought in another downwind), they must also be concerned about what others are doing upwind and upstream of them. And they must expect those downwind or downstream to take an active interest in what *they're* doing.

Second, there's a lot of range between *uninhabitable* and *unpleasant.* Merely inhabitable is not enough to satisfy most of us. POW camps are inhabitable, but few people would choose to live in one. Human beings have demonstrated repeatedly an ability to make their own living conditions unnecessarily unpleasant. Why do it yet again if you know how to avoid it?

Third, we should not simply assume that we're incapable of doing significant damage because the system is too big and resilient. We may

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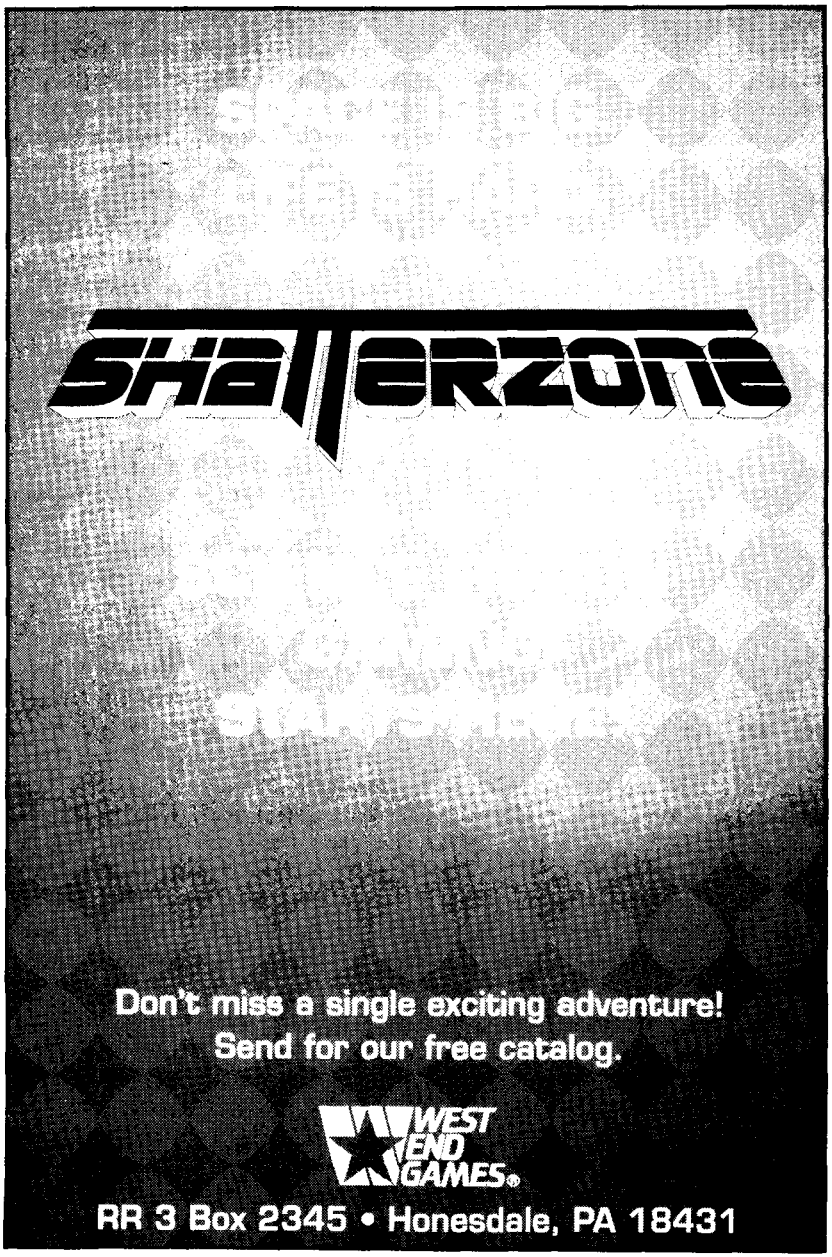
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find that we can do more damage than we thought, because we've spent all of history learning to do things that we weren't able to do before. Our ancestors *couldn't* move a massive tower fast enough to escape the Earth, or change the course of a major river, or convert a desert to fertile farmland (or vice versa). We can and do, almost routinely—and the chances are excellent that future civilizations will be able to move and change things on even bigger scales.

An advanced civilization that assumes it can't hurt things in a big way is like a novice handed the keys to a real wrecking crane, who assumes he can't really hurt anything because he couldn't with the toy one he had as a kid. Don't assume—calculate! And when you do, always bear in mind that there just may be a variable or an effect that you haven't thought about. Sometimes a small force can have consequences far beyond the obvious. The force required to move the trigger of an elephant gun is far less than that delivered by the bullet it releases. ("I didn't know it was loaded. . . .")

Fourth, while it's true that the planet will evolve ways of dealing with change, and eventually strike a new balance (or quasi-balance), it does not follow that we can do whatever we want because the ecosystem will compensate for it. It will, but not necessarily in a way that we would like (or even survive). As James Lovelock put it, "People sometimes have the attitude that 'Gaia will look after us.' But that's wrong. If the concept means anything at all, Gaia will look after herself. And the best way for her to do that might well be to get rid of us."

Perturb the system, and it *will* adjust itself into a new state of equilibrium—but the well-being of *Homo sapiens* is by no means a fundamental constraint on how that happens. One previous balance featured a world dominated by anaerobic bacteria; since the "oxygen catastrophe," those have been reduced to remnants in a few highly specialized niches. The most conspicuous players in a later version were dinosaurs; those are no longer here at all (though they did leave traceable heirs).

We cannot assume that "Mother Nature" knows best and will fix whatever messes we make. She will, but on *her* terms, not ours. From "Gaia's" point of view, it doesn't particularly matter whether the next metastable state has a place for any particular group of organisms. But humans are picky. We're only interested in those futures that have a place for *us*—and not just a place, but a reasonably comfortable place.

The Earth's mass and resilience alone will not guarantee that. If we want to be sure that our futures are chosen from that very special subset—on this or any other planet we may eventually occupy—we shall have to take an active role in choosing them. And that will most certainly require a real concern for understanding (quantitatively!) and working with ecology.

Some may suggest that that's not important because we shouldn't be planetbound anyway, and won't be for long. It may well be that, if you

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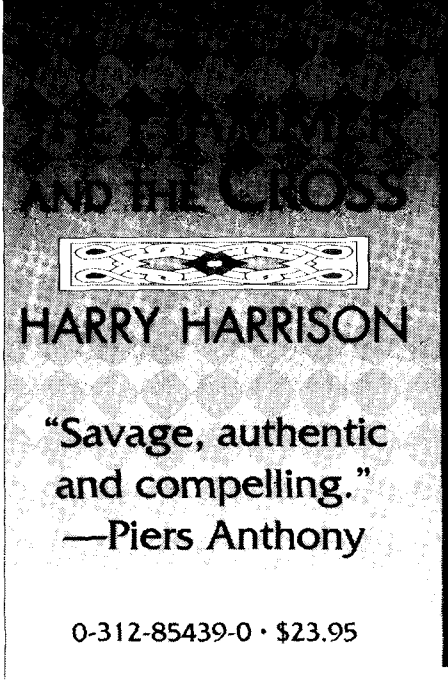

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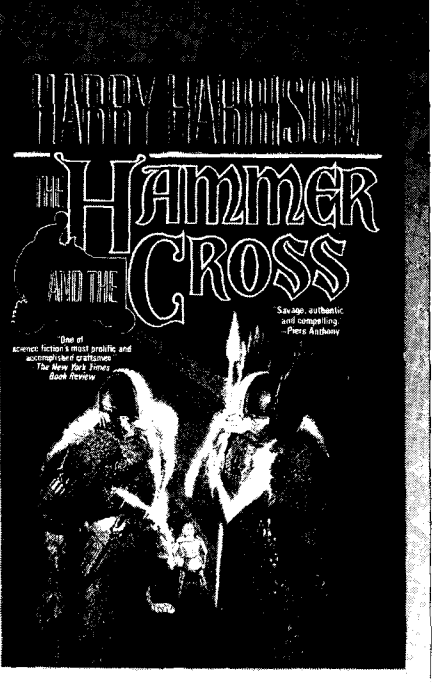
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look at history in the really long term, our kind will eventually outgrow or wear out this planet and move on to something else. But—completely aside from any ethical obligations we might have to other beings we share a planet with—it would be distinctly imprudent to base our short-term planning on that assumption, at least until we're sure we have a better place to go and a way to get everybody there. ■

IN TIMES TO COME

Our December cover story is "Young Again," by Jeffery D. Kooistra, which is not exactly a sequel to "Sunshine, Genius, and Rust." It's more a parallel story, even including some of the same events, but seen from such a different point of view that it's a whole new story, and quite memorable in its own right. This time the focus is on James Christian Dykstra, inventor of the new physics that so permeates this future history of Kooistra's. His background makes him a natural to try to figure out the mysterious and threatening alien artifact that has fallen into human hands—but successful research takes a lot more than knowledge, talent, and determination. You also need the right attitudes, both in yourself and in those who shape your working environment. . . .

Grey Rollins is back with another entry in one of his future histories, in this case his uniquely flavored lunar colony—which now faces a problem it never expected, with a most peculiar cause. We'll also have stories by David L. Burkhead, Kevin J. Anderson, and Phillip C. Jennings, and a ground-breaking fact article by Stephen L. Gillett called "Beyond Prometheus." If somebody asked you to name the single invention that marked the beginning of technological civilization, and its central driving force ever since, what would it be? I thought so. Hang onto your hats, there seems to be a paradigm shift up ahead. . . .

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1

The diplomatic shuttle sat in the faint violet glow coming through the hangar skylights, graceful and competent looking, ready for its mission. Two guards stood nearby sipping coffee which was worse than normal, even by the none-too-high local standards.

The pilot and co-pilot entered, returned the salutes of the guards, and began checking their craft. When they noticed the drugged coffee was taking effect, they signaled for their accomplices.

From a fresh tunnel beneath a tank in one corner of the hangar, two mechanics emerged with a large spherical device. They hoisted it gently through a hatch in the shuttle's belly, and had it installed before the guards regained their senses.

His accomplices hidden, the pilot nudged the sleeping guards awake, chided them for their inattentiveness, and threatened serious action if the incident were ever repeated.

2

"There's somebody down there." Christen Dahl pointed to green areas on the screen.

The man floating beside her squinted, then shrugged. "Can't be. There's nobody on this side of the planet."

"OK, *you* explain it. Each of these areas of growth propagate from the *top* of the wash. The oldest plants are near the ridges. And all the growth on each ridge started at about the same time."

"So?"

"So it isn't natural. These ridges

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Tom Ligon

THE GARDENER

The difference between "creation" and "destruction" sometimes depends on who's describing it. . . .

Illustration by Nicholas Jainschigg

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were planted by aerial seeding, designed to give maximum propagation down the slope." Christen turned her head to give her boss a condescending stare. "Look, you asked for a remote sensing assistant with a terraforming background. You going to take my word on it, or not?"

"OK, if you say so. But it still seems to me that it could be natural."

"*Natural?* A mixed brushland suddenly springs up in the middle of a barren continent, on a barely terraformed world? Think again. Somebody is *down* there."

Larry Dunigan bent over the screen for a closer look. "I guess you could be right. And if so, it's a shame. But what's done is done. Anyway, in the *long run it probably doesn't make any* difference."

Christen floated away from the console, staring at her boss in contempt. "How can you say that? Mazra'ih is an absolutely unique environment. We may never get a chance to study a world so close to primordial Earth again."

Larry looked up from the screen at his twenty-year-old charge, remembering for a minute the sense of urgency he had felt over things he could not control when he was her age. She was enthusiastic, but impulsive, with a lack of practical experience that made her tend to oversimplify problems and underestimate challenges. She *did* know her field, though, and, of course, there was that special ability she had with computers.

"Christen, these people have been through a lot these last seven years. Who knows why they did it, but I'm sure they thought it was important. OK, so the study has to deal with reduced data quality on one continent. We'll deal with it."

"Oh, just a continent. With the natural progression all screwed to hell." Christen tossed her head, sending the spray of hair around her head into a wild series of microgravity oscillations.

Larry smiled. "Spilled milk. How would you fix it? Nuke it back to a sterile desert and start over again?"

Christen raised an eyebrow as if she were seriously considering it. "Well, maybe not, but I'd sure as hell put a stop to it, try to contain the damage, and document what had *been done.*"

Larry nodded. "Absolutely. That's what we'll recommend in our report. I'm sure that the next expedition will make that a major goal."

Christen was alarmed. "The next expedition! That could be a year from now! Do you realize how much of the environment is already affected? Do you know how fast it's spreading?"

"Sure," Larry agreed. "But you are the only planetary biologist on the mission. The primary goal of this expedition is diplomatic, not scientific. And until we have some assurances that conditions down there are safe and stable, there won't be *any* research. How much do you know about the political situation down there, anyway?"

"Just what I know from the briefing and the newspapers. Seven years ago a splinter Muslim group was exiled, wound up here, and took over."

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Larry shook his head. "They weren't exiled, they left on their own. They left because they intended to blow Earth to bits by hijacking a starship and ramming the planet. They have at least a dozen nuclear weapons, and used one of them on a small town down there. Nice bunch."

"So, let the diplomats deal with it. That's their job. Our job is to document how the ecosphere is coming along. So let's sign out an ion jet and go down there and *do* it."

Larry chuckled. "Sorry. It *is* a rather large planet, you know. I appreciate your concern, Christen, but our efforts are best spent on remote sensing. You can drop some probes on the contaminated area if you like."

Christen pouted.

"And wipe that look off your face. There's nothing we can do right now." Larry reached for a keyboard and struck a few commands. "Meanwhile, I think you'll have a better appreciation for the realities of the situation if you read up on the political climate down there." He pulled a crystal from the interface and handed it to her. "Here, this is the latest update."

Christen took the crystal unenthusiastically and stuffed it into her vest pocket. When Larry had left the remote sensing lab, she returned to her console.

"OK, you little vandal, maybe I can't come down and find you, but I sure as shootin' can set a trap for you from up here." She subvocalized a command to her computer, bringing up a new screen.

* * *

3

Christen looked as smug as she had the day she earned her master's degree, barely six months earlier. Her trap was sprung, and it had been well worth getting out of bed for. She floated inverted above the console as Larry pulled himself into the lab.

"You found something?" Larry was still rubbing his eyes from being awakened.

Christen pointed to a speck moving across the screen. "An ion jet." Muscles in her neck moved imperceptibly, obeying instructions which were not meant for them. The tiny computer on her belt understood and obeyed, issuing a command to the console which overlaid the track of the object. "On a seeding run."

Larry blinked a few times, then pulled himself closer to the screen. "You know, I think you're right."

"I've been running a simulation," Christen continued, tapping the streamlined white box on her belt. "If this has been going on for seven years, I think all of this could have been done by one or two aircraft. See? He's planting wide, so the growth will spread into the areas in between in the most efficient manner. He's going for maximum coverage in the minimum time."

"Hmmm."

"So *now* how about an expedition?"

"I don't know."

"Oh, come *on*. It's just one plane. One measly little bunch of vandals. We could shut them down in an afternoon."

Larry squinted at the screen.

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"What's he doing now?"

"Huh?" Christen glanced at the data window in the corner of the display. "He's climbing. Ten thousand meters and . . . *what?* He disappeared! What the . . . ?"

Larry was fully awake by this time. Typing furiously, he called up screen after screen, to no avail. One screen showed the IR signature of water vapor where the craft had disappeared, which distracted him for a few minutes, until he decided it had been used both as a coolant and a decoy. There were many hot-spots, several of which appeared to move, but none had a signature which was consistent with ion propulsion. Larry wasn't sure which of the images he was seeing were man-made objects and which were natural camouflage.

"Damn. Lost him. An ion jet is too small for the terrain-mapping radar to resolve. All these neat toys, and we're not equipped to track aircraft." He keyed the intercom.

"Tracking," the voice from the speaker responded.

"Yeah. Remote sensing. We were just tracking an ion jet down there under survey satellite three. It was at about zero three eight north by one six seven west. He looked like he was climbing for space, then he just disappeared."

"One of ours?"

"No. He's not even supposed to *be* there. Its an off-limits research area."

"OK, we're scanning . . . what were those coordinates again?"

"Zero three eight north by one six seven west. I'll get closer if you like."

"No, that's close enough. I've got the area saturated. How long ago was it?"

"Five minutes. Ten tops."

"Well there's nothing in the air within three thousand klicks of there. He's on the ground, and under something, probably."

Christen looked as triumphant as is possible for someone floating upside down in pajamas. "One ship. On the ground. We know about where. Your move."

Larry considered the problem. "OK. He obviously climbed for altitude then switched off power to glide down, probably to hide his landing area from passive observers like us. Whatever it is probably glides like a brick. He couldn't have gone far. What else?"

Christen thought. "Well, he probably isn't officially sanctioned by their government, or he wouldn't be trying to hide. Think maybe there's a colony of refugees down there?"

"Good point. I'm starting to think you may be right. I'll talk to the commander about an expedition."

4

Christen scanned the displays joyfully. What an adventure! Alone in her very own spacecraft (even if it was a lowly ion jet), with a whole continent to explore (nay, not just explore, but save from wanton destruction); she was master of her destiny.

She had expected the commander to be a hard sell, after all Larry's resistance, but he'd given up with hardly a fight. After all, the little shuttle was exceptionally reliable, and there were probably fewer hazards in the

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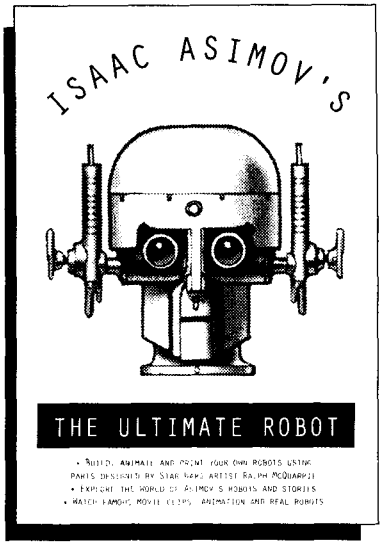

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search area than on any land mass on any planet the *Beagle* had ever visited, Earth included. He concurred that the culprits were probably peaceful refugees. The only exceptional dangers should be on the populated side of the planet.

The only catch was that he couldn't spare any additional crew from the main mission. Ambassador Bakhash would have had a fit. For Christen, the prospect of a solo adventure was just fine, even if it did mean a few restrictions.

She checked her gear one last time as the retrofire countdown proceeded. Survival kit, emergency comm gear, all in order. Over a thousand vials were loaded into the autosampler, ready to store pollen and whatever else there was to find. She cycled the retractable cameras which would deploy after reentry. The broad spectrum EM array checked out. She even had a gravitometer aboard to detect underground hideouts. And, against all orders, she carried a shovel and some plastic bags.

Larry's orders were, "Don't land. Just gather aerial data. If you find anything, I'll see if the commander can spare a team. And don't do anything foolish. You're my only employee, and I don't want to have to do all the work *myself.*"

Christen issued the mental command to link the tiny computer on her belt to the ion jet's system, and began the departure sequence.

Reentry was a time-consuming routine. The de-orbit burn was over the unpopulated side of Mazra'ih. Half an orbit later, over the populated side, the little ship skimmed into the outer fringes of the planet's ionosphere, where it began to experience drag and lift. It skimmed back into space slightly, then eased down into the ionosphere for two more skips, before beginning its final slow descent into the atmosphere. The process took over two hours, but it was far less damaging than the meteoric reentries of bygone eras.

Comfortably down in the stratosphere, Christen gingerly took the controls. Her flying skills were rusty, and she had only a few hours of experience in this model of craft. A few hours in a simulator had helped, but it didn't have the marvelous swoopy sensation of the real thing. Besides, one gravity was plenty after a week in orbit, and she had no desire to add more by horsing the stick about.

Settling down to a leisurely Mach 2 cruise, Christen began a high altitude preliminary search. The EM array had forward, side, and down-look capabilities from microwave to x-ray. The vandals would have to be pretty clever to hide from *this* technical marvel.

Three hours later, the vandals were looking pretty clever.

Christen had identified three long, dry lake beds within range of the vanishing point of the rogue aircraft, and concentrated on those. She pulled back the reactor throttle, adjusted the altitude autopilot, brought her craft down to a bare three thousand meters above the surface, and began sampling the air in earnest as she searched for signs of human activity.

"OK, you bastards. There have to

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be some skid-marks or *something* down there to give you away."

She was flying over some of the oldest growth on the continent. What she saw amazed her. From space, she could tell there was considerable diversity of plant life, but she had no idea how *much*.

Christen keyed her recorder. "Amazing plant diversity. I'm slowing down and going in closer to see if I can identify species and growth. We don't have enough data for accurate remote sensing without some close calibration."

From an altitude of one hundred meters she could make out individual plants. None were especially large, but many of the trees were over five meters tall, and could be identified by their shapes.

"Definitely some evergreens. Looks like loblolly, blue spruce, and Virginia junipers. Holy Moses, those were pin-oaks! And a grove of fruit trees, couldn't make out the type, but they look like they've got fruit on them."

Splat.

She was startled by the soft but sudden sound, and glanced at the windscreen. A bug. A *big* bug. There were at least two other smaller ones, perhaps three, all of different species, if the color of the goo meant anything.

"OK, so they're *thorough* vandals. Several varieties of flying insects here."

Splat-splat-splat. "Getting more insects on the windscreen. Must be bunches of them, and a lot of diversity. And one of them definitely used to be a honey-bee. I can't be sure, but most of these look like pollinators. I'm climbing a little, while I can still see out the windscreen.

"Over flat-lands now. Sort of a grassy savannah. Getting drier as I go south toward the lake bed. Several different colors down there, I'll have to check the pollen samples to identify the types. And the genetic background. I'll bet a lot of this stuff is genetically engineered stock from the populated area. Hey, there's a patch of what looks like crimson clover."

Christen made passes along the two other valleys with lake beds at their southern ends, documenting the growth while searching for signs of a landing area. She found nothing, and was getting tired and discouraged. The constant altitude changes from the terrain-following autopilot were taking a toll on her stomach, as well.

"Larry?"

"Yeah, Christen," the comm system responded.

"I'm getting nothing down here. I'm going to set down for a while."

"NO! That's an order! Get back up here."

"How can I put this delicately? Fact is, boss, I've been in this thing for six and a half hours so far, without benefit of a ladies room, and I have certain pressing matters to attend to which are best done with both feet firmly on the ground. Don't worry, I'm landing on a lake bed that looks just like Edwards Air Force Base. Smooth as a concrete runway and forty klicks long."

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"All right, but no exploring. Let me know when you're down safely."

Christen flew low and slow along the lake bed. Confident that it would suffice, she set up an approach into a light northerly breeze and descended gradually toward the surface.

The little spacecraft settled gently onto its wheels, slowed to nearly a stop, then punched through the crusty surface and sunk to its belly in thick mud.

"Oops."

When the little ship finished settling, Christen unbuckled from the pilot's seat, made her way to the hatch, and opened it. The steps automatically deployed and crunched into the dry surface. Christen probed the lake bed gently with one foot, then stepped completely out of her craft. The surface seemed solid enough to walk on, anyway. She walked slowly around the ship, surveying the damage. Nothing seemed to be broken, but it was bound to need a thorough cleaning and going-over before being airworthy, or spaceworthy, again.

"Christen, you down yet?" Larry sounded worried.

Christen leaned into the hatch and replied. "Yeah, I'm down."

"Good. How soon do you think you'll be airborne again?"

"Um, that depends. How long until the dry season around here?"

"What?"

"The dry lake beds around these parts are a little tricky."

"You aren't stuck, are you?"

"Yeah, and real good, too. Can you send a tow-truck?"

"Dammit, Christen! Everybody up here is busy as hell. We've got a shuttle full of VIP's coming up to settle the deal. Well, young lady, might as well make yourself comfortable, because you're going to be there a while. And stay with the ship, for Pete's sake!"

Christen looked around. Of all the places she had seen today, this had to be the least interesting. The nearest vegetation, other than traces of algae growing on the cracked mud, was probably ten kilometers away. She looked at her boots. A few little tan insects scurried by. She fished out sample containers and collected half a dozen, plus some of the mud. That was about the limit of scientific study possible on this God-forsaken spot.

Then it struck her: she was standing on a planet almost a hundred light-years from Earth! She had never stood on another world before, not even the Moon. But after hours of flying above it, this place seemed Earth-like and familiar, not alien.

And *empty*. She had stood alone in the desert southwest of the United States, with no sign of mankind for as far as she could see. That was lonely enough. But this was an entire empty *continent*. She looked at her mired craft, and then at the sky. Just now there would be nothing overhead but the surveillance satellite in synchronous orbit.

Of course, she was not entirely alone. Somewhere, probably nearby, was a band of strangers. Strangers who had been trying to hide. Strangers who must now know they were being sought. What was the word for

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such people?

Outlaws.

5

Starship security is a critical thing. One cannot take lightly the responsibility to control power which can destroy worlds. It is also usually boring, which makes it that much more difficult to do as well as it must be done. And it is an imposition, which means it annoys those on whom it is imposed. But Janet Arnold knew, as few others could, just how important the job was.

Janet Arnold directed security aboard the *Beagle*, or perhaps orchestrated is the more accurate term. She made it sing. Many parts came together to make a functional whole.

Ambassador Bakhash watched from over Janet's shoulder as she barked orders to her subordinates.

"OK, as soon as the shuttle is between you and the *Beagle*, give me a low-level broad-band gamma burst, once every few seconds. And keep it collimated. I want resolution, over."

"Wilco, out," replied the geep orbiting a thousand klicks away. The order called for an extravagant expenditure of reaction mass to maintain the spacing as the approaching diplomatic shuttle maneuvered to rendezvous with the *Beagle*.

"A little paranoid?" the ambassador asked.

Janet looked around at him. "Oh, good morning, sir. No, I don't think so. With all due respect to your ethnic background, sir, I don't trust those slimeballs any further than I could throw them on Jupiter."

"Don't you think that's a little harsh?"

"No. I was on the *Starry-Eyed Dreamer.*"

"Ah, the starship that was hijacked. I understand. But perhaps your personal feelings make you overreact?"

"Well, sir, the bastard who masterminded it is probably down there somewhere. . . ."

"Yes. Al-Hariri."

"Uh-huh, and he is one determined, clever, and ruthless son-of-a-bitch. You're right, it's personal. He's responsible for the deaths of eight of my friends. But he *wanted* to destroy Earth. No, I don't think I'm overreacting."

"But we know the people aboard this shuttle. There is no reason to expect trouble, and I don't want to offend them at this delicate a part of the negotiations. They very much need us to reopen the Gate, and we would very much like to, if they can guarantee security."

"Sir, do you know what causes wars?"

"Why, military buildups, of course."

"Sometimes. Or sometimes disarmament. Actually what causes wars is that *the leadership* of *at least one side* thinks it sees an advantage in starting a war."

"But . . . yes . . . yes, you are quite right. I'd never thought of it quite that way. Simple, but correct."

"Now these nice people on the shuttle are eager for peace, and so are we," Janet continued. "But Al-Hariri wants conflict. This settlement is all wrong for his plans."

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"How can you know that?"

"Have you heard from him?"

"No."

"See?"

"No."

"He has fallen from power," Janet explained. "He lost it to our friends on the shuttle out there. He wants what the Mihdi wanted. He wants his power back, he wants them out of the way, and he wants us to stay away. Or he wants our ship, if he can get it."

"I see. So what do you think he will do?"

"In this situation, I can only think of a couple of things he *can* do. And I'd bet a month's pay he will. He's been doing it all his life, especially when he couldn't get his way politically."

"I am sure you are right about Al-Hariri's motivation," the ambassador replied after a moment's thought, "but the moderates have assured us that they have taken every precaution to prevent an incident. Don't forget, *they* know him even better than we do."

Janet shrugged. "I hope you're right, and if so I'll just look like a good, cautious, pain-in-the-butt security director doing her job as inconspicuously as possible. If you're not . . ."

An instrument operator waved his hand. "Jan, I think we've got it."

Janet and the ambassador floated over to the console. There, on the screen, was the ghostly outline of the shuttle, with a network of nebulous framework and workings, and two dense masses, one large and cylindrical, the other a small sphere.

"What is it?" the ambassador asked, pointing to the larger object.

"*That's just the reactor, sir,*" replied the operator. "But this," he pointed to the sphere, "is a larger, dense spherical shell containing a smaller shell about twenty centimeters in diameter. The outer shell has an absorption spectrum consistent with depleted uranium. The inner sphere appears to be plutonium, and masses about fifteen kilograms."

"A nuclear weapon." The ambassador said a silent prayer.

6

Jamil Al-Hariri impatiently scanned the monitors in his makeshift command center. A small team of technicians were intently watching their respective stations. The canvas shelter, its sides rolled up, snapped gently in the evening breeze.

One of the technicians spoke. "Sir, I'm getting periodic low-level background radiation on their gamma survey monitor."

"Hmm. Probably just accretion from the neutron star, but . . . keep watching. Never underestimate starship security."

"Sir, if they detect it, our mission fails."

"Don't be so sure, my young friend. I would consider it to be a complete stroke of luck if we should actually gain control of the ship. What is important is that we make the attempt. The United Nations are cowards first, meddlesome fools second. For now it is enough that they just go away, perhaps for another seven years. When they return, *we* will be in

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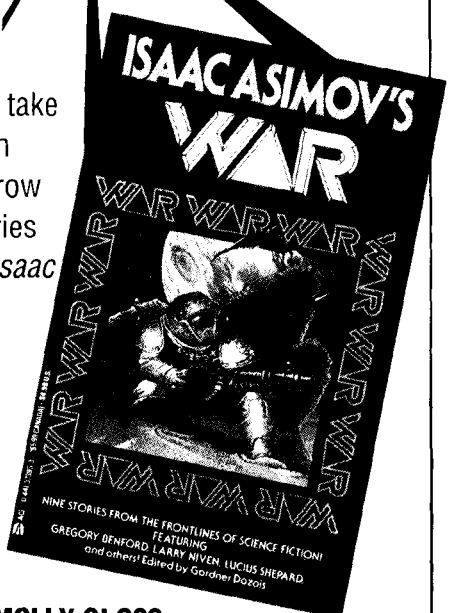
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charge."

Another technician spoke. "Sir, they may be on to us."

"On audio," Al-Hariri ordered.

With a click, the speaker switched to the orbital traffic UNICOM frequency.

". . . Await further instructions. I repeat, delta-v minus one five three and await further instructions. You are not cleared to approach the *Beagle.*"

"What is their proximity to the starship?" Al-Hariri asked nervously.

"Seven hundred and forty-two kilometers, sir."

"Damn! I'd hoped for closer. Oh, well." He raised the red cover on a switch.

The technician seated nearest the switch grabbed Al-Hariri's hand. "Sir, no, that's the destruct switch."

Al-Hariri struck the man with the back of his hand, sending the technician sprawling on the gravelly ground. "Of course it is, you moron. What did you *think* we were going to do?"

The technician sat up, rubbing his jaw. A combination of fear and loathing spread across his face like the rough stubble of his beard. "Try to take the ship. Wasif and Ruhollah deserve the chance to *try.*"

Al-Hariri glared at the man. "They knew the odds were long. Very, very long. They didn't expect to come back."

"But to not even have the chance. . . ."

Al-Hariri threw the switch. ". . . Is really a pity. But such is life. . . ."

A flash of light raced across the sky from the east, followed by a bright glow on the horizon and a wild display of colors high in the atmosphere.

". . . And death."

Al-Hariri admired his handiwork, but considered that it was a shame that he had so few nuclear weapons to work with. They were, after all, so marvelously effective when used properly.

7

Christen was alarmed by the sudden flash of light in the sky. The morning glow had not yet fully obscured the tremendous violet plumes the natives called Hellspiral, which dominated the sky of Mazra'ih, but the flash appeared to have nothing to do with the natural fireworks emanating from the nearby neutron star/red dwarf binary.

Could the starship have made a hasty departure? Had they used the c-prime engine while still in orbit? She considered such a dangerous event unlikely.

"Larry?"

There was no response on the infrared comm-link through the satellite. She switched to the radio, and was greeted by a piercing howl. She accessed the satellite computer by infrared. The computer responded, but indicated that all systems were busy. Christen had never seen that response before.

Too late, she switched her ship's broadband EM array on. Pointed across the lake bed, it could only analyze back-scattered radiation. It offered a bewildering glimpse of a rapidly fading spectrum of radiation unlike anything Christen had ever en-

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countered. The spectrum was full of strong emission lines, mostly from common metals, with mere suggestions of actinides and other heavy elements, and Christen wondered if it could be a supernova somewhere in the vicinity. The odds were incredibly long, but the evidence seemed to fit.

She continued the trials for half an hour. The radio noise gradually diminished, but still she could not raise the *Beagle*. The satellite became more communicative with time, but declared most of its sensors off-line.

Finally a brief message broke through on the IR. "Christen, this is Larry. Something's happened. The Shiites tried some stunt, I'm not sure what, but we're bugging out, c-prime in a couple of minutes. Don't expect us back. Sorry, you're on your own. We're probably out of range of your comm system, so I don't expect a reply. Good luck."

"Larry . . . Larry . . ." There was no response.

"C-prime in a couple of minutes" was not good news. Standard practice was to do a conventional fusion burn for several hours, then switch to carbon-hydrogen implosion mode for a couple of days before lighting off the main engine. The full effects of c-prime on nearby planets were not well understood, and only a severe emergency would make them try such a thing.

The ship's sensors registered an unusual spike which Christen recognized as the *Beagle* entering c-prime. It looked nothing like the earlier episode.

Christen barely had time to consider what had happened when a strong new signal was picked up by the array. It was the exhaust of an ion jet, not near enough to see, but in line of sight with the array. Christen fumbled through her gear and found a pair of image enhanced and stabilized binoculars. She climbed out of the ship for a better vantage and began searching in the direction of the indicated signal.

In less than a minute, she found a bright speck at the wavelengths of ionized air. She locked on and magnified in the visible range. The craft appeared to be a Sunfire, a classic early model of ion jet. She watched it bank in a 180 degree turn. With its broad back turned up toward her, she could make out a military-style camouflage pattern.

She watched it cross her valley about a hundred kilometers away, then U-turn again. It was on a parallel search pattern.

Christen wanted to be found, but by whom? By the outlaws she was seeking to banish from this continent, and who knew she was searching for *them?* By the Shiites, who had just "tried some stunt," and who had a history of unspeakable mistreatment of hostages? Could they possibly be one and the same?

She studied her surroundings and considered the paucity of options. The flat lake bed obviously offered only quick discovery. At its closer edge, ten kilometers distant, the terrain rose sharply into the surrounding hills. At least there she would have a chance to think and ob-

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serve whoever was searching for her. And who knew, perhaps the *Beagle* would think better of it and come back for her. She gathered the emergency kit, the binoculars, and a few other items, and began her first 10K run in quite a while.

Christen was nearly exhausted when she reached the shoreline. She turned to study the sky. The Sunfire had broken off the search pattern and was making a beeline for her stricken vessel. She scrambled up the slope to search for cover.

From behind a large rock, she watched the menacing-looking ship pass over hers, then turn to set up a landing approach. Expecting it to lower landing gear, she was surprised to see it instead deploy an inflatable device which looked like a life raft. The Sunfire settled onto the dry mud with barely a puff of dust, and floated up to her stuck craft. The lone pilot got out, studied the scene, stooped to look at the mud, then looked directly in her direction.

Startled, Christen looked around frantically for a better hiding place. She spotted a small canyon which looked as if it might have a cave or two, and began cautiously making her way toward it. She looked back to see the Sunfire rapidly skimming across the lake bed toward her, and broke into a run for the canyon. Once there, she spotted a large vertical crack in the wall, and squeezed into it.

She noticed a funny smell, then everything went black.

8

Christen became aware of rough lips and an unshaven face pressed into hers, and hot breath being forced into her lungs. She feebly tried to push her assailant away.

"Ah, I see you've had enough, Christen."

Christen coughed and opened her eyes. The world was wobbling slowly back and forth, and little blue lights were flashing in her eyes, but she could make out the silhouette of a man hovering above her.

"Please don't think I was enjoying it. I always supposed I would if I got the chance, but frankly, the whole time I was too afraid it wasn't going to work for me to savor the moment."

"Who ... (cough, rasp) ... are you?"

Christen thought she saw him smile as he replied, "Johnny Appleseed. Don't try to get up. Just rest for a while and pay off that oxygen debt."

"What happened?" Christen winced as she spoke. She felt a doozy of a headache coming on.

"You learn to be careful of caves on this world. Some of them harbor large numbers of the first wave of bacteria from the terraforming process. They sometimes do unhealthy things to the air."

That made sense, in fact, Christen was embarrassed that she hadn't recognized the danger. The first step of terraforming was to tie up as much carbon in organic form as possible, to put oxygen in the atmosphere. Sea basins, swamps, deep crevices, and other repositories were likely to accumulate some rather nasty compounds until geological processes had a chance to bury them.

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The stranger backed off, and sat down on a nearby rock. The distance made Christen more comfortable. Now in better light, she could see that he was rather rough-looking, with dark, weathered skin, long, wavy, greasy-looking black hair streaked with grey, and a week's growth of beard. He was the perfect image of an outlaw. He spoke excellent English, but with a middle-eastern accent, probably Persian (or Iranian, or Farsi, or whatever that mixed-up part of the world called their language this week). She estimated his age at around forty.

"So, Christen, do you have a last name?"

"How do you know my name?"

"I was listening to your communications."

"So you're an eavesdropper as well as a liar. Your name is *not* Johnny Appleseed," Christen snapped. She immediately felt guilty for scolding her rescuer, but blamed the outburst on the headache.

"You're right," he said, smiling broadly, "but I've been waiting for years to say it to someone." His mood suddenly darkened. "I am Sadiq."

That sounded more likely, if somehow less comforting. "Well, Sadiq, I am Christen Dahl."

"Christen. I liked that name as soon as I heard it. It sounds like Christ. Are you a Christian?"

Christen eased herself up and slid gingerly against the talus at the base of the canyon wall for support. "Nominally. I was born an Episcopalian, but I haven't been in a church in at least . . . five years. And you?"

Sadiq picked up a rock and toyed with it, focusing past it to infinity, and pondered the question. "I suppose I am an agnostic. I am not sure God exists."

Christen was surprised. Religion was the trademark of Mazra'ih. But she still was uncomfortable about her predicament, and wanted to know in whose clutches she was. "And the rest of them?"

"The rest of whom?"

"The rest of your group. The ones doing the seeding."

Sadiq laughed. "I'll take that as a compliment. There is only me."

"*You* did all that damage *yourself?*" The words slipped out, complete with recriminating tone, before she could stop them.

Sadiq seemed taken off guard. "Damage? Oh, now I understand. I knew you were from the *Beagle,* but I assumed you had a security role. You're a planetary ecologist, then?"

"Yes."

"Well, I suppose I could ask you what you think of my little garden, but I'm afraid I already know."

"I suppose you do. Mind telling me why?"

"Habitat for an endangered species. Decent humans. Seven years ago, when the Mihdi took over, there was no place to hide. Now there is."

"But you've ruined a whole continent!"

"I selected the most isolated one. And by no means the largest. I wanted to minimize the damage."

"But you picked the most unique one. The others are either landbridged or too close together to

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study isolated development."

"I considered that. But I also considered the fate of this planet. Mazra'ih has only about eight thousand good years left before it passes through the jet of that neutron star out there. When it does, little, if anything, will survive. But if it wasn't for that periodic blasting, life would have already existed here when we discovered Mazra'ih. This continent is so isolated that, except for a few seaborne species, natural distribution and evolution would probably introduce a new species only every fifty thousand years or so. You would have to move it along artificially anyway."

"But we'd do it scientifically."

"And I suppose you think I haven't. You are welcome to my records. But the fact is, you abandoned Mazra'ih. I couldn't. So now, like it or not, it's *my* experiment." Sadiq looked up at the shadows on the canyon walls. "We're wasting a perfectly good morning, and there's lots to do." He began picking up Christen's gear.

Christen tried to stand, but couldn't. Sadiq caught her as she fell. "I didn't mean you had to get up. Here." With a sweep of an arm he scooped her up. Christen was amazed at his strength as he carried her and all her gear down the rocky slope to his ship.

Close up, the Sunfire was hardly an impressive sight. It showed its age and a history of damage. Missing panels were replaced with hand-made replacements, some held on with metallic tape. Parts which looked like they came from a hardware store were bolted on in odd locations. The peculiar inflatable landing gear was scarred and patched. It didn't look airworthy.

"Make yourself comfortable," Sadiq said as he lowered her gently into the right front seat of the cramped cockpit. "There's an oxygen cannula in that compartment to your right. It should speed your recovery. Use all you want. We used it for a long spaceflight many years ago, so it's equipped to generate more from water."

Christen fitted the cannula as she watched Sadiq start an auxiliary compressor that forced air into the outer jacket of the "raft." Evidently the thing had an opening of some sort at the bottom, so that it acted as a skirted air flotation device.

They taxied out to the stuck research ship, where Sadiq got out, taking a shovel from the clutter bungeecorded behind the seat. Christen noticed that, where there would normally be a key, this ship had a plain switch, and it was obviously not original equipment. She wondered if the ship had been stolen, then realized that there was nothing to keep her from flying away. She was tempted.

"By the way," Sadiq called back as he walked to her ship, "don't try to take off without me. That cranky old thing would probably crash before you knew what hit you, and I'd be left with this nice new one."

Sadiq dug the mud from around the landing gear to form ramps, a process which took several hours. As Christen's headache gradually cleared, she spent less time with her head back and her eyes closed, and more time watching Sadiq. Shortly after he

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started, he removed his shirt, revealing a lean physique and compact but rippling muscles. He was no bodybuilder, but Christen had to admire his physical condition. Obviously he had acquired his build through old-fashioned hard work.

"There," he said when he was finished, "in a few weeks the lake will be dry enough that we can just drive it out. Now I'm going to take you back to camp. Your color is back, and you look a lot perkier. Are you hungry?"

"Yes," Christen nodded enthusiastically as he eased the throttle forward. The twenty-four ion compartments gulped air and pulsed it out the rear of the ship in a low, throaty moan. He used barely enough power to accelerate to flying speed.

"No need to hurry," he explained. "She may be a crop duster now, but she's still a spacecraft at heart. Even an old Sunfire can glaze the surface if you use too much power, not to mention leaving a hot-spot that will show up for days."

Once airborne, he throttled up slightly. The craft responded with a surge of acceleration and the classic song that made the Sunfire famous, and which finally banned it from many airports on Earth. Sunfires were underpowered by modern standards, at only forty to sixty megawatts, but they converted their power to acoustical energy with more efficiency than modern ships. Aficionados compared the roar to a pair of P-51 Mustangs. Nimbies just called it a racket, and insisted that only ion jets with dampened exhausts, like Christen's modern model, be permitted to launch.

Sadiq shouted over the din the noise cancellation system couldn't totally eliminate. "I'd give you a cook's tour, but you've already checked these valleys, and I suspect you're too tired to care. You flew right over my camp, by the way."

"I never saw it."

"Don't feel bad. The Shi'ihs have looked for it a few times, and they've never found it either. Of course, their equipment isn't as fancy as yours, and they don't have the manpower to waste tracking a hermit gardener all over a continent on the wrong side of the world."

Sadiq pushed the throttle further forward, and the craft responded with a spirited leap forward. "The old girl still has some fire in her belly," he commented as he eased the nose up toward the sky. The airspeed indicator climbed impressively as the ship raced through a thin layer of clouds. "Not bad for a bird two years older than me. I have to hold her back a little, though. Don't like to push her past Mach point eight, or I might lose some of the patches." He throttled back to maintain the cited airspeed. "Also don't like to take her much past ten thousand meters. The seals are five years past due for replacement, and I wouldn't want to be too high if they failed. Speaking of which, I think I'll try some of that oxygen myself."

They raced for the sky in silence for a short time as Sadiq fitted his cannula. "As I'm sure you noticed, I take some precautions in case anyone's watching." He chopped the throttle. The sudden loss of thrust made the

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Sunfire ballistic, and the cockpit weightless. Christen shrieked at the unexpected transition.

"Oh, come on, you're used to weightlessness."

"Give a girl some warning, will you?"

"OK, well, here's some gravity back." He rolled the ship over and pulled back on the stick. Three gees pushed Christen down into her seat as the ship split-essed onto a nearly reversed course. "Sorry, I don't mean to be so rough on you, but I have to take a few precautions. As I said, the Shi'ihs don't have very sophisticated tracking equipment, but they have come after me a few times. This forces them to use radar to track me to my landing site, and I can detect that. It gives me time to lead them on a merry chase."

The Sunfire dove steeply for the mountains, holding the high speed. Sadiq pulled up gradually, leveling off between two peaks. "If you'll notice down there near the bottom of this saddle, there's a thin cord. It holds a radar corner reflector shut. If I'm tracked, I can fly through it, exposing the reflector. The sudden intense reflection locks their tracking system. By the time they figure out I haven't crashed, I've made my getaway."

"Does it work?"

"Did once."

"Will it again?"

"Hope I don't need to find out. I have a few other tricks, though." They turned to parallel the slope northward. "This route covers terrain that hides our EM signature this time of the day."

The little ship slowed gradually as they hugged the mountains. It shuddered periodically as it encountered updrafts from winds hitting the slopes. The speed was still impressive, and Christen could barely make out the many forms of vegetation racing past fifty to a hundred meters below.

"God bless automatic terrain following," she gasped as they cut particularly close to a ridge.

"Oh, I turned that finicky thing off years ago. Kept scaring me. I'm hand flying." Sadiq turned toward the flatlands, following a little wash toward the edge of the second dry lake Christen had searched. He leveled off into a gentle glide slope, deployed the landing bag, and set the craft down lightly on the dry surface. The ship slowed, then he turned and taxied back toward a rocky overhang.

"Tracking said they thought you must be under something." Christen looked down at the unlikely landing system. "And now I know why I couldn't find skid marks. Did you design this?"

Sadiq smiled. "Oh, that's an *old* invention. Dates back to the 1960s, I think. Never caught on back on Earth, but it's simple and effective, and easier to built than conventional landing gear. Lets you land on anything, as long as it isn't pointy. Just the sort of thing we like on Mazra'ih. I put it on after *I* got stuck in the mud. Bent the oleos and mounting points so badly they couldn't be repaired, and we'll try to fix almost anything here. Had to fly halfway around the planet with the gear down, which took three

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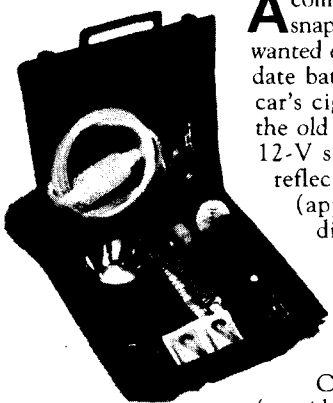

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days. Does that make you feel better?"

Christen nodded. "Helps my pride a little. But somehow I stopped worrying about what my boss thinks a few hours ago. Do you have any idea what's going on?"

"Vaguely. I began eavesdropping on your comm channel when you tripped one of my alarms. I couldn't pick up your transmissions, but I could pick up the ones from your satellite. I knew you were stuck, but I thought you'd get help from your people. When I saw the flash this morning, I suspected they would have to make a run for it. That's why I came looking for you. That last message only confirmed it."

"I've never seen anything like that flash," Christen said as they climbed down. Sadiq began unloading her gear. "Do you have any idea what it was?"

"I was hoping *you* did." Sadiq watched Christen's unsteady stance, but saw that she could walk. He started up a trail. "I saw something sort of like it once. I hope it wasn't the same thing."

Christen didn't like the tone of that. "What did you see?"

"A town on the other side of the mountains from mine was destroyed by a nuclear weapon. But this was different."

"Actinides," Christen said softly.

"What?"

"My ship has a broadband EM array. I got a glimpse of actinides in the afterglow."

Sadiq stopped. "The bastards. So it has started again. I'd hoped we could hold it off longer." He started up the trail again, a little slower this time. Christen followed, silently considering the ramifications.

The camp was spread out in a grove of young trees. There was a small but evidently well planned and kept shelter, some technical equipment, and piles of materials Christen recognized as being the stock-in-trade of a continental gardener. She was starting to accept that label in lieu of vandal or outlaw now. She could understand and accept the urgency of Sadiq's mission and the professional skill he evidently had as an ecologist, even if she still resented his taking over an important experiment, one which mankind might never have an opportunity to repeat.

Sadiq set up a folding chair with wooden side-rails and a fabric seat. "Sit down. Make yourself comfortable. I'll start lunch."

Christen realized she was famished, even if she was still a little queasy from the wild ride. She sat down. The chair was surprisingly comfortable, and it was a rocker! She studied the unusual but simple mechanism of crossed levers.

"More old-fashioned Earth handicrafts," Sadiq commented. "Easy to build and very practical."

As Sadiq busied himself with camping gear, a thousand questions raced through Christen's mind. She remembered the crystal Larry had given her, and felt the pocket. It was still there. She plugged the crystal into the tiny computer on her belt and linked.

The database on Mazra'ih was extensive and as comprehensive as anyone on Earth could make it. Among

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other things, it included the last census completed before the Shiite takeover. She looked up the name Sadiq. It was not common. Only two men, both Shiites, bore it, and neither was close to the apparent age of this man.

Then she remembered something which had struck her as odd on the flight to camp. Sadiq had said the Sunfire was two years older than he was. Christen was no expert, but she estimated that the craft couldn't have been over thirty. She checked the vehicle registrations for that make of craft. The oldest on the planet was the original geological survey craft brought by the first colonists. It would now be twenty-seven. She thought she recognized the registration number as the one above the comm panel of Sadiq's ship.

"Sadiq, were you born on Mazra'ih?"

"Yes, why?"

"Just curious. You seem so attached to it." There were no Muslims on Mazra'ih when Sadiq, or whoever he was, was born. At that time, the entire population, which was tiny, was Baha'i. She found the birth records. Only two children born on Mazra'ih would now be twenty-five. Only one was male: Habakkuk Safwat, firstborn of Mazra'ih, son of Husayn and Mirabel, two of the leaders of the expedition.

"Habakkuk? Wasn't he a Hebrew prophet?"

The man dropped the plates he was about to set the table with. "Wha . . . who?"

"How can I ever trust you if you don't stop lying to me, Habakkuk? Can I call you Hab?"

"You might as well. The few friends I have left do. Baha'is come from many backgrounds. I never met my namesake. He was a convert from Judaism that my father knew on Earth and respected a great deal."

"So you're a Baha'i?"

"So you're a Christian?"

"I'll just sleep a lot easier tonight knowing you are a pacifist, not a cutthroat."

"Don't be so quick to judge people by labels. A good Muslim is a very good person, and not everyone born a Baha'i is worthy of the name. Enough of that. Dinner is served, m'lady."

They ate in silence. The meal was hearty, primarily the fruits of the land. Hab was not only a good gardener, he was a good cook. But he was hiding something, evidently something ugly. Christen wasn't sure she wanted to know what it was.

Hab spoke first as he cleared the table. "I think we should head back to civilization in the morning. You should see a doctor, and I need to get some news from some people I know. I think perhaps the time has come when this place will be needed. I would have liked a few more years, but I think it could support thousands of refugees now, if it had to."

Christen suspected there was something more to it than those plausible reasons. She felt rejected somehow, as if her detective work was threatening something, and that Hab wanted her out of the way.

But, though the sun was high in the sky, it had been a long and exhausting

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day for Christen. That and the good food made her drowsy. She faded to sleep before she could study her host further. He prepared a cot for her, laid her in it gently, and tucked blankets around her against the evening chill.

And then he sat beside her and cried.

9

A strange sound awoke Christen in the middle of the night. She was disoriented for a moment, until she realized she was in a cot. The strange grunting noise was coming from the ground nearby.

Hab was thrashing wildly, and muttering something unintelligible. Christen sympathized at his nightmare, but not so much that she wanted to risk waking him. She watched the mysterious and troubled stranger until the worst passed, moving objects from his unpredictable kicks when she could.

The return to peace renewed her curiosity. She accessed her computer again and studied random bits of history as subjects came to mind.

The Baha'is were pacifists, dedicated to a unified world order which would abolish many of man's worst habits. They followed the teachings of a nineteenth-century Iranian named Baha'u'llah. Christen had to admit that she found the precepts appealing.

An interesting aspect of the Baha'i faith was acceptance of science. They seemed to take the sensible approach that the function of religion was not to explain the physical world, but to guide the spirit. Physical reality was what it was, and religion could easily accept that, since it had no bearing on truly spiritual matters.

The Baha'is were ideal candidates for colonists. They could be trusted to establish a good and tolerant government, and were scientifically inclined, which was necessary to establish a sound ecosystem. Unfortunately, they had been neither suspicious enough nor mean enough to control the exiled madman that had been sent their way.

The Mihdi was the self-proclaimed Messenger from God who was suspected of orchestrating a campaign of terror culminating in an attempted hijacking of a starship. According to the confessions of one of the hijackers, the goal was to destroy Earth. Prior to the attempt, about three thousand of his most faithful followers evacuated to space on three large fusion-powered freighters. When the attempt failed, they were not invited back. Finally, Mazra'ih had agreed to accept the exiles, and they were Gated to the system. Within months they had taken over.

Baha'u'llah had a predecessor, an individual called the Bab, or Gate. That explained why the local Thompson Gate was called Sol-Bab. Nur, the local sun around which Mazra'ih orbited, was Light. The original Mazra'ih was an estate acquired by the early Baha'is during an exile, which became both a real and symbolic garden refuge. Most of the major features on the planet had similarly symbolic names.

The Baha'is had a turbulent history.

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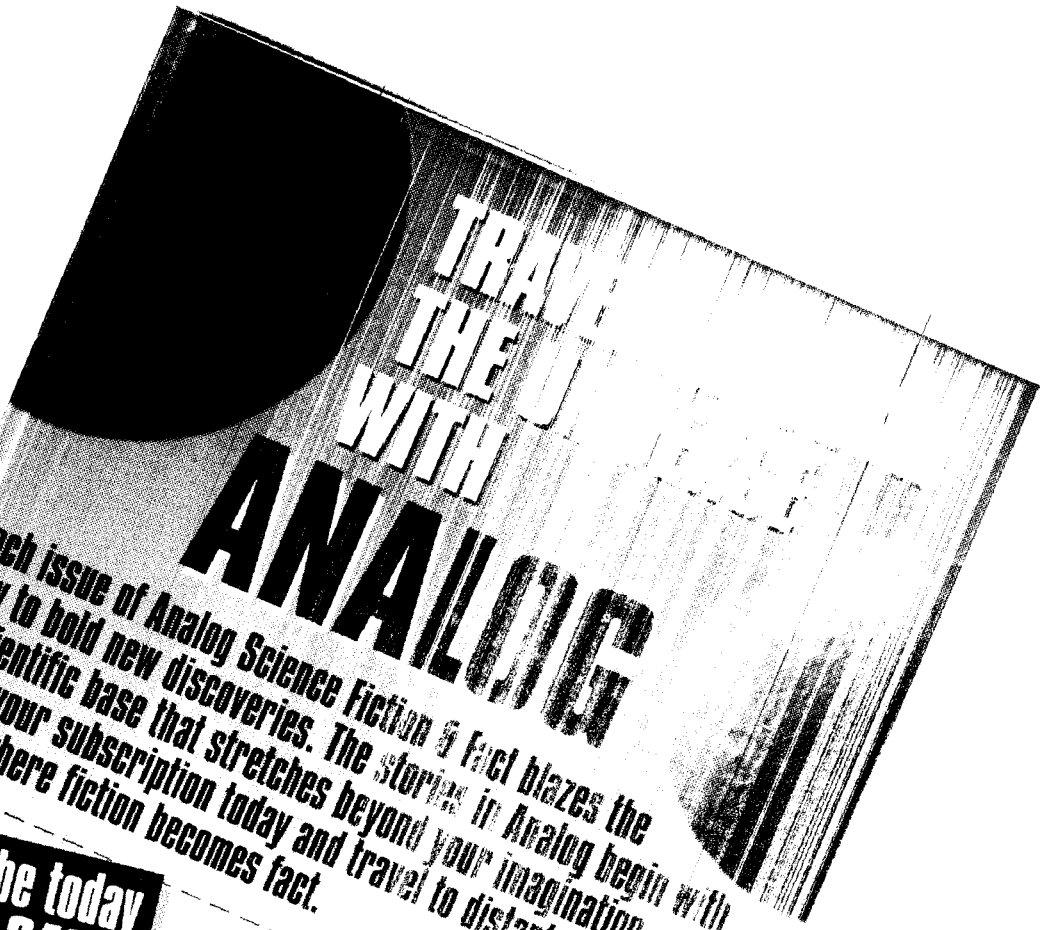

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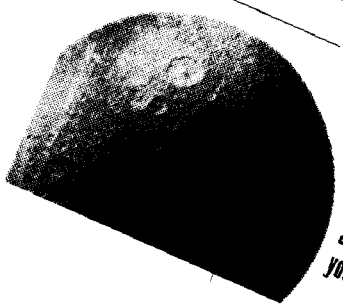

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The Shiites had persecuted them, on and off, for two centuries now, and had persecuted the Babis before that. It seemed that the Baha'i teaching that mankind could comprehend God only through two "perfect mirrors," Christ and Baha'u'llah, rubbed Shiite fundamentalists the wrong way. Islam taught that there were no intercessors between man and God.

The Baha'is believed that the community, and society as a whole, was obligated to defend itself against aggression. A police force, or even an army, was necessary until humanity developed the wisdom and maturity to behave as it should. However, Baha'is as individuals, and as a religious body, were prohibited from taking arms in the name of the faith. The foremost reason was that they believed there was no sin so great against them that they could justify committing as great a sin. To a lesser degree, the policy was because they had a history of taking a hundred of their enemies as converts for every martyr lost. But there was also an incident in which a young Babi, in anguish over the execution of the Bab by the Shah of Persia, fired a small pistol at the Shah, slightly injuring him. The young man and about eighty Babis were executed, and Baha'u'llah and many others were imprisoned.

The young assassin was named Sadiq.

10

When Christen awoke again, Hab was busy making breakfast. She watched him for a few minutes as she let the cobwebs clear. He had shaved and sported a self-inflicted haircut. It was a big improvement, and made him look more like an ecological scientist than an outlaw.

He smiled when he saw she was awake. "Better get moving. Big day today. It takes twenty hours to fly back to civilization."

Christen groaned, remembering her own ordeal, only a third that long. "Non-stop?"

"I usually make two short stops, one on either shore of the ocean. There are some islands more or less along the way if there's an emergency."

Hab was patient with her efforts to help during the preparations. He had a routine, and the best strategy appeared to be to stay out of the way. The Sunfire had already been cleaned up, stripped of field gear and much of the external hardware, and had fresh tape on the patches. Hab loaded it with empty sacks and items in need of repair, and they were off.

They flew low toward the coast. "Let me give you the tour of my back yard," he said as he turned the Sunfire up the valley shortly after takeoff. "I've planted over a hundred species of grasses and another fifty or so of browse plants. There are forty-two species of trees, including twelve types of fruit trees. Those are apples below."

"I didn't think you could grow apples from seed. Did you graft all those?"

"Oh, no. On Earth, most apples and many other fruits are hybrids that don't reproduce true from seeds. But the ancestral plants do, and those

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have been genetically engineered into productive variants, which are what we grow on Mazra'ih."

An insect hit the windshield. "I wish they wouldn't do that. They have more important things to do. As I'm sure you noticed, I've introduced insects. Actually, two species were living along the coast when I arrived, feeding on the algae seeded during terraforming. I've put in a lot of pollinators, but I've also released predators, food insects, and all sorts of creepy-crawly things that build soil. I've stayed away from species like termites so far, because the plant-life is too young to need the deadwood broken down. And I seem to have forgotten to bring any mosquitoes."

Christen nodded approval. "What sort of model are you using?"

"Modified Nagamatsu, same as what was used in the populated area. I suppose you have better ones now, but I'm not sure the Sunfire's computer can run any fancier code."

"As a matter of fact," Christen replied, "I brought more sophisticated software with me. And a computer to run it on." She reached to tap at her computer, then decided against it and just laid her hand casually over it. "How is your plan working out?"

Hab shrugged. "I had some trouble at first. Tried to introduce everything at once. The predatory insects usually died off, and I lost a lot of the other fauna by introducing them in the wrong habitat or the wrong part of their life-cycle. I finally learned to time the releases better. The insect population is the hard part. It's easy to plan the flora, but everything is so dependent on bugs, and the interrelationships are so *complicated.* Just the figs depend on a highly specialized wasp *and* a particular variety of ant. The ants can't get by without a particular variety of fungus plus several other plants and some other insects. Those insects need a certain flower, a certain bush, and it goes on. Mostly I just introduce as balanced a mixture as I can, then let nature take its course, and just try to patch things up when they need it."

"That doesn't sound very scientific," Christen commented.

"Science in the sense of the scientific method, maybe not. It isn't a controlled experiment. It's more of a demonstration exercise, ecological engineering rather than ecological science. I'm putting scientific theories into practice, then documenting how the system works and doesn't, and filling the holes in the theories as well as I can."

"What sort of balance are you going for?" Christen asked.

"My first thought was to plant food-producing flora, but that's a little one-sided. Refugees need habitat, not just food. They can bring quite a bit with them, and hydroponic gardens can begin producing quickly. But there was no place to hide, no cover. Anything they planted would show up like a sore thumb from space. Mostly I've planted a lot of diverse small patches in what amounts to a camouflage pattern. Drives remote sensing types crazy."

"Tell me about it," Christen said appreciatively.

"It was also unbearably lonely. I

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want animals over here. So far, the only vertebrates, besides myself and some rodents I've released in the grasslands, are a dozen pairs of hummingbirds I brought over last year. It took that long to get their habitat going. They're at another camp of mine down south in a semi-tropical region. I planted a combination of flowers that would bloom year-round, with the right sequence of colors and the proper blossoms, then hand-pollinated them for years until there were enough. But it was worth it. They're doing splendidly. I'd hoped to bring back some other birds before this mess broke out. They would help considerably in spreading seeds, if I'm careful with what I introduce. Of course, anything migratory is difficult to establish on a new world.

"I've got several species of oaks, which I had to hand plant. In a few years they'll be productive enough to support squirrels, and then I'll have a little help with the planting. Spreading seed was the main reason I introduced ground squirrels and a couple of other rodents in some of the grasslands, but by next year I hope they can support small predators.

"I opted for the most diverse ecology I could contrive. It still needs plenty of work, but I'd be willing to bet it's the biggest garden any single individual ever planted. Unless there is a God."

The comment made Christen realize that this *was* a veritable Garden of Eden, even if it was a bit underdeveloped. He was the only man, and she was the only woman. And tragedy was brewing. Soon this place could be overflowing with Cains slaying Abels.

They stopped to stretch their legs and freshen up on the sandy shore of a bright green ocean. Hab delivered a safety briefing. "Here are the flotation devices and survival kit. Here is the emergency locator transmitter. The canopy release is here. Pull hard. They sometimes jam in a crash, so there's a pry-bar down here. If we go down, though, we'd probably be better off hitting hard."

"What's *out* there?" Christen asked, thinking immediately of sharks, but she instantly recognized how silly that idea was for someone with her background.

"A few jellyfish. Nothing to live off of. No maritime rescue service. No shipping activity. I'd try to make it, but the odds aren't good. Next landfall is twelve hours. Are you ready?"

Christen nodded slowly, and they were off.

They were uncomfortably silent for about fifteen minutes after takeoff. Hab finally broke the ice. "How are things back on Earth?"

Christen thought for a moment. "Not much has changed in the last seven years, I guess. No wars. No major catastrophes. Had a mild recession. No, wait . . . we met a new race, the Kreekan. They have wings! They have a c-prime communications technology, and we're trading them Thompson Gate technology for it."

"C-prime communications . . . do you know what that would have meant to us seven years ago?"

"Or now," Christen added.

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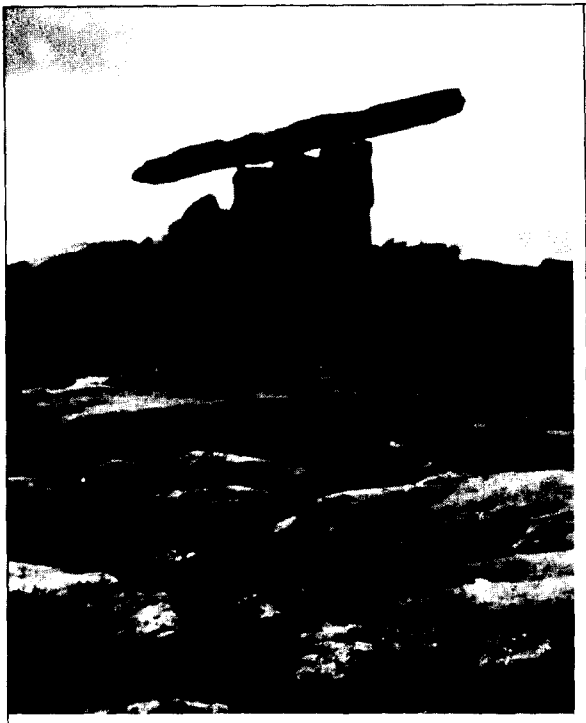

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"Do they have starships?"

"No, and I don't think there are any plans to give them any. We get along well, and they seem friendly, but we're entirely too much alike for us to trust them with the ultimate weapon."

"Good."

"Oh, and Dr. Thompson has another new invention. A transporter!"

Hab's face lit up with obvious delight. "Beam me up, Scotty."

Christen smiled, pleased to discover that Hab knew the classics. "Not exactly. It's a little quantum displacement transmitter, sort of like a Gate, but with a phased wave that can deposit you up to a few hundred kilometers away. It can beam only one way. It's still experimental, but they expect it to replace a lot of shuttles within ten years or so. And they tried to give her a third Nobel Prize for inventing the Gate, but she turned them down. Said the first was just a spin-off of the c-prime work she was developing, the second was for c-prime, and the third Nobel would be based on a mysterious engine problem in her first ship. She didn't think she should get three for one invention."

"So Dr. Thompson is still alive. She must be nearly a hundred by now."

"A little over, I think. Lots of people live that long now, but not many are still that creative."

"I think," Hab said pensively, "that not many are *ever* that creative. Anything else?"

"A few months before I left, Mohawk haircuts came in fashion in high schools again. Didn't last as long as it takes hair to grow back, though."

Hab laughed and rubbed his head. "Never does."

"Now you fill me in," Christen said. "What's been going on here?"

Hab looked suddenly sad. "Seven years of waiting for the other shoe to drop."

"Can you be just a *little* more specific? I know the Mihdi and his followers took over. I know they destroyed the Gate and cut Mazra'ih off from the outside world. Apparently he died shortly after that?"

"Yeah. Yeah, he died just a few weeks after that. It's what we all wished for. We thought it would solve all our problems."

"Well, it seems to have done the trick. It seems to me the Shiites and Baha'is have been getting along fairly well, at least until now."

Hab shrugged. "When it's Us versus Them, Us thinks Them is a single entity. There were actually two major factions among the Shi'ihs, the moderates and the radicals. Evidently, when the Mihdi convinced his followers to evacuate to space, they weren't aware of all the things he had done. Once they were stuck out there with him, they found out he'd desecrated some High Holy Places to get souvenirs for the trip, and that he'd attempted to hijack a starship in order to destroy Earth. Didn't go over too well among the truly faithful. Then he revealed his own version of the Koran, which is the sort of thing Muslims are *really* suspicious of. By the time he settled here, he had two-thirds of his flock alienated but too scared to kick him out. When he died,

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the two factions split. The radicals, who are the *real* problem, were badly outnumbered, so they quieted down."

Christen was confused. "Why are you so negative about it? You sound like the last seven years have been horrible. I'll tell you, things are a lot better than we'd feared back on Earth. We thought he might have exterminated you by now."

Hab shook his head. "On the surface, maybe things were better. But the Mihdi's death didn't change the basic problem. The radicals are still in charge of the militia, they still have access to the nuclear weapons, and they still hate almost everybody. They just didn't have the skills needed to survive by themselves. There are only about a thousand of them, against over two thousand moderates and about forty thousand others, mostly Baha'is. They are destroyers, not builders."

Christen nodded. "So, they went along to get along, and bided their time until they could throw another well-timed monkey wrench into the works."

"So it appears."

"How did he die?"

"Who?"

"The Mihdi. How did he die?"

"I heard he just dropped dead one day while making a speech." Hab avoided eye contact as he spoke.

"Oh."

"Apparently the circumstances gave some of them the idea that it might be an act of God."

"Oh."

There was dead silence for about two minutes.

"Hab, what do you think about the conspiracy theory?'

"Wha . . . who said anything about a conspiracy?"

"My understanding is that the Mihdi was assassinated."

"Where did you ever hear such a thing?"

"Who said I heard it? Sadiq."

Hab turned to Christen and glowered. "Why are you doing this to me? And how? How are you finding out all these little details? Are you some kind of walking encyclopedia?"

Christen winced. "I have my resources. Look, I'm not trying to cause trouble, and I have no doubt what you did saved your people, but the fact is you are a *terrible* liar."

Hab hung his head. Christen could see tears forming in the corners of his eyes. "You think I don't know that? Why do you think I'm out here? Planting habitat is just something useful to keep me busy, so I don't go insane. The fact is, if I'm around people, I'm bound to let something slip. I *want* to let something slip. Yes, I staged an act of God. And if the Shi'ihs find out about it, it could lead to the deaths of all my people, and the destruction of their faith."

"So nobody else knows?" Christen pulled a tissue from her kit and dabbed his eyes.

Hab took the tissue. "One other person knows. We're on our way to meet him."

11

They flew in uncomfortable silence the rest of the way across the vast,

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featureless ocean. Christen took the controls for a few hours so that Hab could rest. Tired of the distraction of searching for controls and indicators in the unfamiliar cockpit, she checked the Sunfire's computer for a wireless interface. Sure enough, it had one, obsolete but usable. She linked her computer to his and began poking about its contents.

After setting up the displays to her liking, she explored further. Hab was right, the computer was barely capable of running the Nagamatsu model, much less the code she had in her unit. The environmental model and its data occupied most of the mass storage, with only a little left over for the craft's operating software. However, she found a small encrypted text file, unrelated to either the ship or the model, in a protected directory, and, loving a challenge, downloaded it.

Before she could begin deciphering the mysterious file, Hab began to have a nightmare. He tossed and turned so violently that twice his right hand struck her face. By the time he awoke, she had a fat lip and a bruise above one eye, and had forgotten the coded file. He wouldn't look at her, and so didn't notice.

They passed over the coast and were headed inland, when Hab finally broke the silence. "There's something I want to show you."

They headed for a large mesa about fifty kilometers inland, flew over it for a way, then Hab turned the Sunfire toward a large canyon cutting through the soft stone. They dropped between the rims and Hab pointed out layers in the rock. "This canyon was first explored by Baha'is hiding from the Mihdi, seven years ago. They found some things I don't think the original researchers noticed. Do you see the brownish bands? Those are the passages through Hellspiral. That thing has been there for an awfully long time, perhaps fifty million years. The bands are more variable than you'd expect. Nur's orbit around the binary may be somewhat chaotic, but there seems to be an orbital resonance that keeps bringing it back into the plumes."

The ship continued to descend into the canyon. "Here's where the small bands stop. The big ones way down below are obviously the fuel exhaustion collapses and final supernova that produced the neutron star. The original star was barely large enough to supernova, about three solar masses, and didn't do *too* much damage. Below the outburst bands are signs of life, probably the equivalent of Earth's Cambrian era."

Hab applied power and began to climb through time. "For a while there are no bands, as the nebula clears and the system settles. It looks like Nur was far too unstable to support life for a long time, and the binary went through a lot of stages of accretion and ignition before it stabilized, but finally the system entered the more-or-less regular cycles that continue to this day.

"The planet lost most of its atmosphere in the blast, of course. It picked up a considerable amount with time, but not enough to sustain life. But notice this peculiar two-tone band

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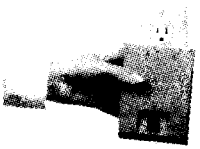

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we're coming up on. There's an almost invisible iridium-rich layer in the black part, resulting from a sudden, short, and heavy bombardment by comets, which built the atmosphere back up. The black layer is rich in organic material, and the white appears to be an ash.

"Notice that irregularly, maybe every one to two million years, there's a similar two-tone band: black on the bottom, and sort of whitish on top. Now watch the top one, just level with the ship. See that thick area up ahead?"

Christen watched the band as it whipped by the canopy. The top band looked slightly different from the others, with a diffused grey band below thicker white. It dipped, cutting through the layers beneath, and broadened into an irregular jumble of white debris about ten to twenty meters thick, extending along the canyon for a couple of klicks.

Hab continued down to the mouth of the canyon, then landed on the river and taxied to shore. As they climbed down from the cockpit, Hab finally noticed Christen's injuries, and apologized profusely.

After they freshened up, Hab led Christen down the shore a way. "I want to show you some debris from that spot back there. Maybe then you'll understand why I'm such a pessimist." He bent to pick up a piece of white rock, tossed it aside, then picked up another. "Here's a good example."

Christen took the rock and studied it. It looked like limestone, but was much less dense. The piece was glazed and cracked on one side. It was strong, despite the low density. It showed little weathering. "What kind of rock is it?"

"Well, to start with, it isn't a rock. It's man-made. Or, rather, synthetic. We are not the first civilization to occupy Mazra'ih."

Christen turned the fragment over in her hands reverently. "Wow! But I guess that makes sense."

"More and more all the time." Hab bent to pick up another fragment. "Here's an even better example."

This fragment had an even more pronounced glazed surface. Christen began to connect the evidence. The broad area was evidently the remains of a city, resting in a shallow crater. The black layers were obviously the product of terraforming, but the white layers of ash were undoubtedly from something destructive. The first civilization, she guessed, had deliberately bombarded the planet with comets to rebuild the atmosphere, leaving a barely visible layer of cometary dust, which put the ash bands in perspective.

"So you think they destroyed themselves in a war?"

"I'm almost sure of it," Hab replied, kicking a piece of the white material aside. "And not just once. It happened a dozen times. Every civilization that has come to Mazra'ih has apparently destroyed itself. Each left a layer of ash over the entire planet. And each time, nothing, absolutely nothing, survived. Not even bacteria."

Christen studied the artifact. "Could passage through the plume have done this?"

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Hab shook his head. "Hellspiral only makes Nur flare. The planet goes into greenhouse. It would kill off most forms of life, but organisms in hot springs and smokers would theoretically survive. It took a supernova to kill *everything* off. Or something just as deadly."

Christen picked up another fragment. "Well, they certainly knew about the planet's cycle, and knew they would have to abandon it. Maybe they deliberately destroyed everything when they evacuated."

"No," Hab said sadly, "in every case the white ash is right on top of the terraforming sediments. The top one only looks different because the land had uplifted to just above sea level when it was laid down. That was a coastal city. None of these civilizations appears to have lasted more than a few hundred years, based on what little analysis we've been able to do. And each time, the destruction occurs thousand of years before the end of the cycle. Christen, tell me, have we found any living civilizations more advanced than ours yet?"

"No. The Kreekan are not quite even with us, and the two other spacefaring races are, frankly, kind of backwards."

Hab nodded. "And how many have we found so far that got a little ahead of where we are and vanished?"

Christen thought. "About a dozen. I see your point. But it doesn't mean it will happen to us."

"Twelve for twelve," Hab said, and started back for the Sunfire. "And there are people on this planet right now who tried to destroy Earth."

* * *

12

After an elaborate series of maneuvers designed to detect tracking and throw off pursuit, Hab set the Sunfire down on a beautiful lake in a region barely more developed than the continent he had planted. They taxied to shore, tied up under a natural overhang, and began hand-carrying their cargo to a cache near a road.

Their chores completed, they retired to the brush to watch for their contact. Barely a few minutes had gone by when they saw a cloud of dust approaching.

"Jeremy is punctual," Hab commented. "He's a terrific friend."

"How did he know we were coming?"

"We have a signal. There's a utility satellite in synchronous orbit that carries all sorts of two-way traffic. His computer intercepted a particular combination of misspelled words shortly before we made landfall today."

"Aren't you afraid the Shiites will intercept it?"

Hab shrugged. "I don't know if they could if they wanted to. But the fact is, there aren't that many radicals to start with, and only about a third of them have any kind of technical background to speak of. Most of the smart ones are permanently stationed on the three freighters that brought them here, and the agreement with the *Beagle* sent them to the other side of the system. It'll take weeks for them to get back."

The cloud of dust arrived, led by a utility van. From it stepped a young

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but sturdy-looking man who was startled to see Christen.

"Jeremy, meet Christen Dahl," Hab said to the man. "Christen, this is Jeremy Gurney."

Jeremy rushed to give Hab an enthusiastic hug, then turned to Christen and offered his hand. "Well, Hab, you've been holding out on me. Where did you meet this beautiful young lady?"

Christen blushed, accepted Jeremy's hand, and smiled.

"Found her hiding in a cave. She *was* an ecologist from the *Beagle*." Hab answered. "Now she's stuck here like the rest of us."

"Well," Christen offered, "I joined the service to see other worlds. Guess I got my wish. Pleased to meet you, Jeremy."

Jeremy noticed Christen's bruises. "Rough landing?"

"It's nothing. Hab does calisthenics in his sleep. He nailed me a couple of times coming over."

"Oh."

Hab looked away and said nothing.

"Can you tell us what happened?" Christen continued. "All I know is that there was apparently a nuclear explosion, and the *Beagle* bugged out."

Jeremy motioned them toward the van. "Maybe we should get comfortable. Come on, sit down. Fresh coffee in the pot, and Hab, I brought some of that stew you like so much."

Hab broke out of his trance and trotted to the van. When Jeremy had poured three cups of coffee and three bowls of stew, they ate. Hab made a tremendous show over the stew.

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Christen agreed it was uncommonly good, but didn't understand the fuss, and said so.

"The first time Hab tasted it, he hadn't had solid food in over a week," Jeremy explained. "I *love* watching him eat it."

"And this time, I'm going to *make* you give me the recipe," Hab said, wiping a dribble from his chin.

"Not a chance," Jeremy replied, nudging Hab's shoulder. "I think it's the only thing that keeps you coming back."

They finished the meal, then settled back to relax.

"OK, time for the evening news," Christen prodded. "What happened?"

Jeremy leaned forward, put his arms on his knees, and hung his head. He spoke slowly. "Apparently the radicals put a nuclear warhead on the shuttle that was taking the diplomatic team up to the *Beagle*. It was carrying representatives from all the major groups. They blew it up in orbit. We lost Mulla Yahya, five other Shi'ihs, two Christian leaders, a Lennonite, and three Baha'is. Sorry, Christen, but the *Beagle* lost a geep with two crew. Hab, the Vazir was on board the shuttle."

Hab threw his bowl out the door of the van and stormed out after it. He stopped to lean against a small tree, and put his arm over his eyes.

"The Vazir was someone special to Hab?" Christen whispered.

"His father," Jeremy answered as he stepped out of the van to comfort his friend.

Christen retrieved the bowl, and listened as Jeremy spoke to Hab.

"You gave your father seven good years, Hab. He was ready to die for peace when you brought him back here, and you made it unnecessary. He died striving for peace. He died doing what he believed in. You should be proud."

Hab pulled away without answering, and turned to look over the lake at the setting sun.

Jeremy touched his shoulder. "I know he was proud of you. He asked me to give you this."

Jeremy put a small package into Hab's hand. Hab glanced at it and put it in his pocket. He took several deep breaths, then rubbed the tears away with his sleeve. "My mother, my sister, my betrothed, and now my father. The bastards are thorough, aren't they?"

"Yes, yes they are," Jeremy agreed. He motioned to Christen, and the two began loading the cargo into the van. Hab joined them in a few minutes.

"We need to get going," Jeremy said, looking over the cargo. "Hab, I thought you said the Sunfire's radar needed repairs."

Christen had noticed it wasn't working. It was a nice unit, if a little primitive, with a fairly powerful maser suitable for narrow aperture terrain mapping from space.

"NO!" Hab was alarmed. "Not again!"

"Hab!" Jeremy rocked his head in Christen's direction.

"She knows already. Never try to keep a secret from her, Jeremy. She's better than one of Al-Hariri's interrogators."

Christen understood. A tight and

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powerful beam of microwaves could definitely be used to simulate an act of God.

"I know how you feel about it," Jeremy pleaded, "but you don't know what's going on. The top leadership of the moderates were all on that shuttle, and the others were rounded up minutes later. Al-Hariri has been holding a big trial, and he's planning a mass public execution in a couple of days."

"You don't understand, Jeremy, I *can't.*"

"You won't have to," Jeremy replied. "I guess it's my turn this time."

Jeremy led Hab back toward the Sunfire's hiding place, and Christen tagged along. Hab waded out to the nose of the ship, removed an access panel, and began detaching the maser. Christen noticed the cables weren't even connected. As Hab lifted the unit from the bay, she saw a telescopic sight attached to the side.

Jeremy saw it too. "When did you add *that?*"

"About five years ago," Hab replied, "when I learned that Al-Hariri was the one who ordered the troops to machine-gun my village." He placed the maser gently in Jeremy's hands. "One more thing." He reached into a compartment beneath the radar and extracted an irregular object wrapped in oiled cloth, and a small box.

13

The journey to Jeremy's home of Lancaster, a tiny Quaker farming community some distance away, took several hours. Christen pumped Jeremy for information, and Jeremy frequently spoke to Hab, but Hab was somewhere else. He barely spoke, and stared blankly out the window into the fading light.

Jeremy made a casual comment about the identity of a species of plant they had passed, and Christen gave an unnecessarily detailed correction and dissertation.

"Hab's right," Jeremy said, eyeing Christen's belt. "You're a walking encyclopedia. And I know why. Hab, did you know Christen's a wirehead?"

Christen was shocked and hurt. She crossed her arms and glowered at Jeremy.

"Huh? What's a wirehead?" Hab showed a glimmer of interest.

"Did you notice that little gizmo on her belt? It's wired into her brain. She's got instant access to more information than we probably have at the main library in Akka. And no computer with an infrared interface is safe if she's in line of sight with it."

Christen bristled as she spoke to defend herself. "I am *not* a wirehead. I'm neurally interfaced. And I wish I wasn't. My parents did this to me when I was three, because they wanted me to have 'every advantage.' And I'll admit, it's damned useful, and has helped me a lot, but it isn't worth the kind of prejudice and meanness that I have to take from people like you."

Jeremy ducked in mock terror. "Sorry, guilty as charged. I should have known you'd be sensitive about it. The fact is, in our present predicament a talent like that could be the difference between success and failure. Um, it's been more than seven

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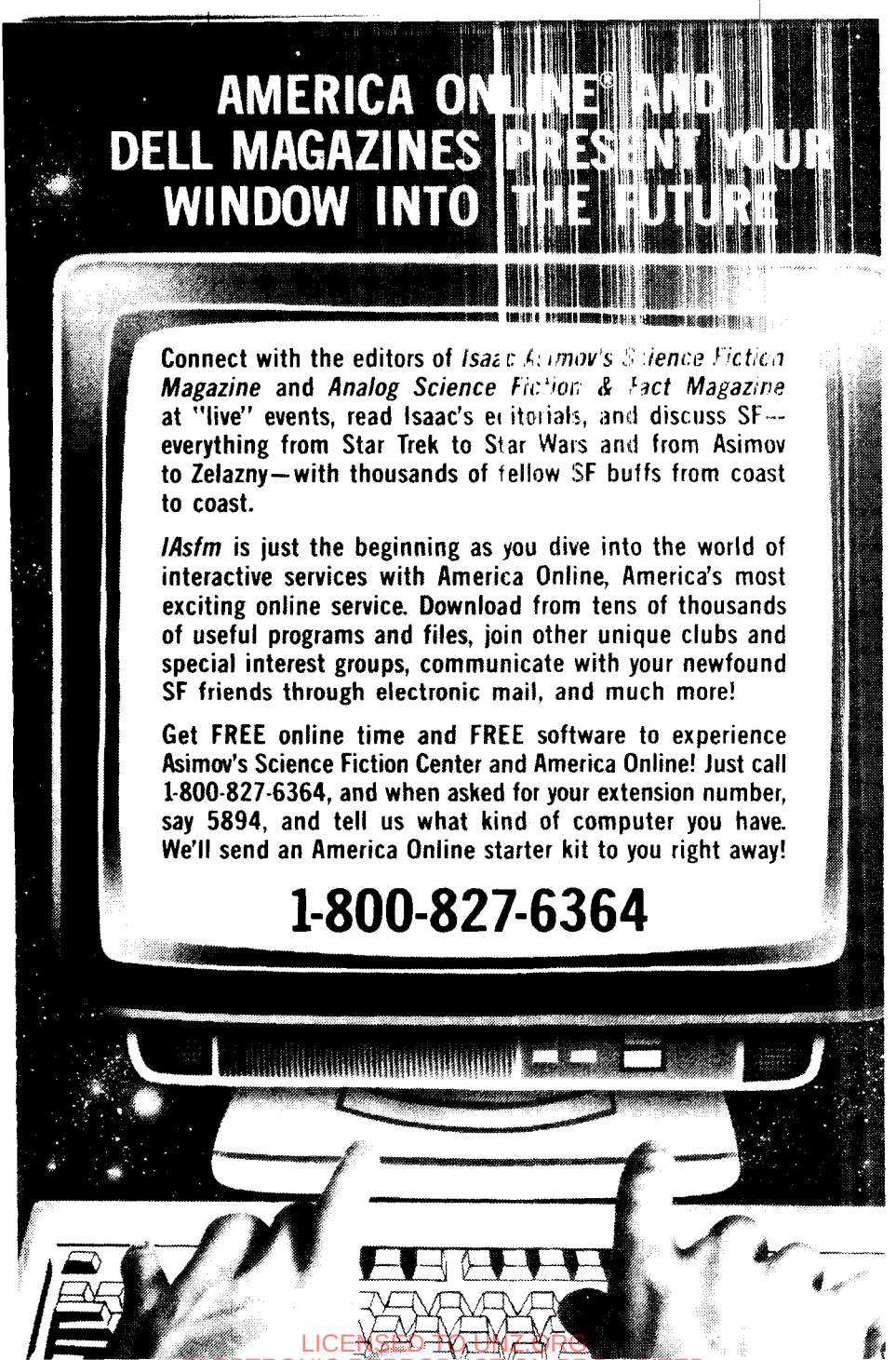
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years since I've heard any news about it. How capable is the unit?"

Christen relaxed. "Well, to start with, it's only interfaced to my peripheral nervous system, not directly to my brain. I give it subvocalized commands, and the information from the computer is primarily auditory. Visual interface has been tried, but the results can be tragic. It's wireless, and links to the belt unit via a transponder under my skin. The external CPU is sixteen meg and runs under AISOS."

"Only sixteen megabytes of memory?" Hab asked.

"Huh," Christen said, tossing her head, "sixteen million, seven hundred and seventy-seven thousand, two hundred and sixteen *processors*, in a three-dimensional array of two hundred and fifty-six on a side, and hypercubed in eight dimensions. Fully optonic, clocking somewhere in the short-wave IR. It'll beat any mainframe you have on Mazra'ih."

"That's incredible," Jeremy commented. "How do you *use* all that?"

"Honestly?" Christen said sheepishly. "Honestly I normally use it like you'd use a cheap pocket computer, for information storage and some calculations and simple models, and to interface with other systems. I've got some pretty tricky programs in it, but it's hard to get much out of them with just an aural interface. My dad got it for me last Christmas. He's into finite element modeling and thought I'd be able to use it. Now nobody will play chess with me unless I take it off and leave it in another room. AISOS is a big help, though."

Jeremy shrugged. "What's AISOS?"

"Artificially Intelligent Secretary Operating System. It can understand generalized queries and commands, pretty much in plain English."

When they arrived at the village, the sky was perfectly clear and Hellspiral was at its zenith, providing enough light to reveal a quaint collection of two-story nineteenth-century style farmhouses made of plastic and asteroid metal.

Christen stared at the eerie and awesome jets of the binary with renewed appreciation. Earth seemed so permanent, four and a half billion years old, with billions of human inhabitants whose roots went back a million years and more. Their Sun would burn for billions more years, and, with care, the planet would thrive as well.

Mazra'ih, on the other hand, was doomed to an eternal cycle of destruction. And yet that very fact made it one of the few planets able to support Earth-type life which did not already bear life. There was simply no responsible way to merge Terran organisms into a pre-existing ecosystem, and so the planets with life were off-limits. The "prime directive" had finally grown up from the exploitative early versions made popular in science fiction.

This was not a great problem, since mankind could easily build space habitats in virtually any system with asteroids and comets. In fact, that was often the smarter choice. Gravity wells are generally more trouble than they are worth from an economic standpoint, and continuous sunlight

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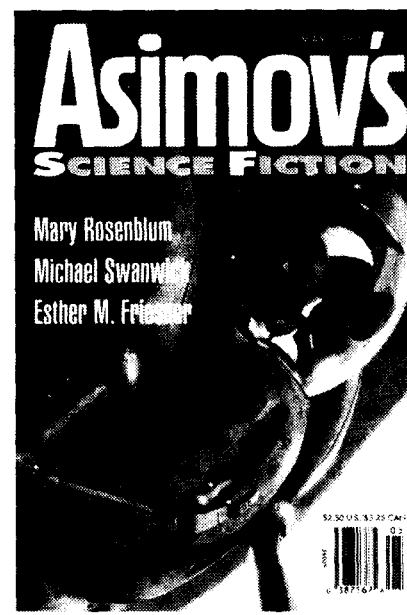

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or another energy source, abundant raw materials, and human talent are all any economic system really needs to prosper. Indeed, those things had been the backbone of industry that supplied Mazra'ih, although the space-based industries had evidently suffered even more than the planet during the Mihdi's takeover.

Economics aside, there was always that inexplicable longing by those born of Earth to have soil under their feet, and sky over their heads. The prospect of a new world, of land and wide open spaces, and of a return to earlier values held an undeniable attraction.

But what price did the collective psyche pay to live under this great violent executioner? Even with the date of sentence eight thousand years away, did the lack of a sense of permanence make them cherish life less?

Christen was tired. Jet lag had chased her around the globe, and it had been a very long day, with only a few catnaps in twenty-five hours. Following a brief introduction to Jeremy's family, she retired to her room, snuggled under a handmade goose-down comforter, and drifted off to sleep.

Downstairs, Hab and Jeremy discussed a more immediate peril: one less predictable and conceivably more dangerous than the plumes of the neutron star, and promising to deal death much sooner. Both understood that something must be done, and soon. Both knew that any effective action would be dehumanizing, the sort of thing that tears out the soul of a person born to peace.

After their discussion, Hab took a long walk through the fields. He dug his hands into the rich dirt, remembering when it had been only smelly clay. He considered what it meant to be the first human born on this world. It was his, more than any other's, both to cherish, and to defend. Jeremy had been there only nine years. He had a wife now, and three children. And while Jeremy's faith in God was no stronger than Hab's own, at least he still had a soul.

He gazed up at the spectacular violet display in the sky, and wondered for the two-thousandth time what effect it must eventually have on the collective psyche.

14

Hundreds of kilometers away, in Akka, capital of Mazra'ih, a rough-looking Shi'ih named Ahmed looked over a list of enemies identified by the revolution. There were at least three hundred new names, but he did not see his sister's among them. He wondered how long her luck would hold out. How could she have been so *stupid* as to marry a Baha'i and convert to their bastard faith? He rubbed his sore jaw.

There were many names on the list he knew well, few did he consider dangerous. He considered himself a loyal follower of the Cause, and had always served as faithfully as he knew how in the fight to preserve the True Path and the faithful against perpetual attack, but now he was having his doubts.

After seven years on this desolate world, Ahmed had finally worked his

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way to within a few steps of the Inner Circle, close enough to observe the hidden dealings that fueled the Cause. He did not like what he saw. After years of relative peace and tolerance accusations were flying like bullets, and were apt to be just as deadly.

When the same tactics had been used years before on Earth, a youthful Ahmed had accepted them without question. Now he knew most of the charges were fabrications intended only to promote fear and compliance. He understood the necessity of such tactics to the goals of Al-Hariri. The necessity in defense of Islam was not so abundantly clear.

His thoughts went back seven years, to a day when the news had been the destruction of a warship sent by the Zionist lackeys, the American NSA. There had been such a joyful uproar! Ahmed had met a strange young man that day, who seemed confused and out of place. Upon hearing the news, the young man began to pray, and the sobering effect that act had on the multitude had stunned Ahmed, and made him realize how shallow his own faith had been. His present doubts, he knew, dated from that event, and the Mihdi's death the following day.

The whispers now were that the "warship" was merely a freighter full of refugees. The lie and the unnecessary cruelty pecked at Ahmed like impatient vultures from Gehenna, unwilling to wait until he was dead to begin tormenting him eternally for his sins.

* * *

15

Christen overslept. She awoke to a soft knock on the door.

"Who is it?"

"Jeremy. May I come in?"

"Of course."

The door opened slowly, Jeremy peeked in and looked around. "Good morning. I was hoping Hab was here."

Christen's head was clear enough to catch the implication. "It's not that sort of relationship."

"Sorry. His bed wasn't slept in and I can't find him anywhere."

Christen stretched, then rubbed the bruise over her eye. "Maybe he was afraid he'd break something. Have you tried the van?"

"My thought exactly," Jeremy said, closing the door.

Christen crawled out of bed, noticed her clothes were cleaned and hanging on a chair by the window, along with a robe, and that fresh linens and toiletries were on the nearby dresser. She slipped the robe on, found the bathroom, and brushed her teeth.

She was back in her room a few minutes later when there was another knock, this time more frantic. "Christen?"

"Come in, Jeremy."

Jeremy burst in. "The van is gone. I found this note."

Christen took the note and read it aloud. "'Can't let you end up like me. Keep the faith.'"

She handed the note back. "Does this mean what I think it means?"

"If you think it means Hab has decided to shoulder the weight of this whole world again, yes."

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"He took the maser?"

"Yes, and he left this." Jeremy held the irregular package, which he unwrapped for Christen to see. The oiled cloth covered an automatic pistol.

Christen took the weapon and looked it over. She checked the action, verified that it was unloaded, and handed it back. "Nine millimeter UN service pistol. Nice piece. Why didn't he take it?"

"Gives him nightmares. I guess he thought we might need it. If he uses the same tactics he did last time, he's better off not having a recognizable weapon. You handle this thing like you know what it's for."

Christen shrugged. "I ought to. I cut my teeth on one just like it. I used to win bets by knocking the necks off of bottles at a hundred meters with it."

Jeremy didn't seem to be impressed. "Whatever. The thing gives me the willies, too. I don't think Hab ever fired it. Here. You take it. Maybe you can knock the necks off a few radicals with it."

Christen accepted the pistol and a box of shells. "Light loads," she commented. "The sort used by spacecraft security. Hollow points designed to stop in the target without putting holes in the ship. Not good at long range, but deadly enough."

Jeremy went to the window and stared toward Akka. He seemed lost in thought for a moment, then turned to Christen. "I'd like to go after him, but he knows what he's doing. I hate the thought of making him face this alone, but he's probably safer if we don't interfere. But, God forbid if he should fail, I want you to teach me to use that thing. I'm plan B."

Christen aimed the pistol out the window. "In a pig's eye. Left eye, that pig, right out in the pen. I'm afraid it would take more than one box of shells to teach you how to use this thing. If anything happens to Hab, you can count me in."

Jeremy smiled just a little. "So, you *are* sweet on him."

Hab *was* kind of a hunk, she thought to herself. She lowered the pistol and looked down at it. "I guess, a little, but the fact is he saved my life out there in the wilderness. He literally brought me back from the dead, and I'll be damned if I can remember thanking him for it."

"Well, I hope you get the chance. After this, he will need all the moral support he can get. Hab isn't cut out for this sort of thing."

Christen sat on the bed. "Tell me about him."

"I wonder what I can tell you that you don't already know. Hab is without a doubt the kindest, gentlest, most self-sacrificing individual I have ever met. Very intelligent, not always smart. Emotionally devastated."

"Post-traumatic stress disorder," Christen observed. "I had enough psych to spot that."

Jeremy nodded. "But that's just the start of it. Survivor guilt. Watched the only girl he ever loved get gunned down, along with his mother, sister, and the rest of his village. Full of doubt that he did the right thing, and constantly tortured with the worry that the whole thing will backfire

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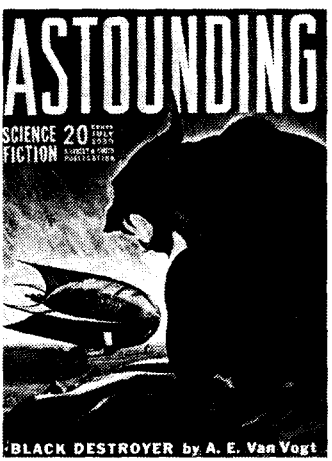

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some day. And he lost his faith. I don't know if you appreciate what that means."

"I guess not," Christen replied. "I went to Sunday school every week for years, but I can't say I ever believed a word of it."

"Then let me tell you. Faith is a great anchor. It gives you something absolute to hold onto when your whole world is being swept away. With an unshakable belief that God is watching over the Universe, and things are unfolding as they should, you can weather almost anything. Hab could really use something like that right now. Unfortunately, the only certainty I think he really has is that the whole thing is a myth."

"And he has no one but you to share the burden with?"

Jeremy shook his head. "He only shares it with me because I discovered his plan, and helped him with it a little. Hab would never ask someone to help carry something he feels so guilty about. I know I've tried to fix him up with dates a dozen times. He always refuses."

"Thank you, Jeremy," Christen said at length. "It *does* help me understand him better."

There were voices from below, then footsteps on the stairs. Jeremy and Christen suspended their conversation.

A man came to the open doorway. "Jeremy, can I have a word with you about that screwball friend of yours?"

"Christen, this is Ben. He's our village historian. Sure, Ben, what's Hab done now?"

"Came by my place last night, oh, 'bout midnight or somewhere after. Said he needed to borrow the video system."

"You loaned it to him, I hope."

"Yeah. What's it for?"

"A surprise, Ben, a big surprise. If it works out, I think you'll be pleased. Christen, if you'll excuse me, I'd better go see what else he borrowed."

Jeremy left, and Christen wondered if she was falling for the enigmatic hermit from the other side of the world. She had a strange desire to return to the wilderness with him. She knew a part of it was professional: her chosen career was the study of terraforming, and she could do that better with Hab than in any remote sensing bay the UN could assign her to. She knew she could make a big difference on this world, greatly improving the efficiency of Hab's primitive methods. In part, though, she suspected the romance of camping out in Eden with a handsome man who had been unbearably lonely for seven years had something to do with it. She wondered how much her hormones were affecting her judgment, and pondered the consequences of becoming the partner of such a bundle of problems.

She remembered the mysterious computer file. It occurred to her that, somewhere in one of her sub-directories, there was a piece of decryption software. She asked AISOS to find it, read the start-up instructions, and set her array of processors to the task of decoding the file. In less than two seconds, the code was broken, and the computer began to recite the contents.

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Eighteen years ago, I became the first native, the first creature larger than a paramecium to be born on Mazra'ih. . . .

Christen listened, spellbound, as the machine spilled out Hab's soul. When it was over, she felt she knew and understood him completely. And she loved him with all her heart. She also had a secret of her own to bear. Hab must never know she had read his diary, his confession.

16

Jamil Al-Hariri smiled as the judge read the verdict to the fifty condemned prisoners huddled in front of him. The executions would make quite a convincing show, and televising them would be such an efficient way of making sure the bullets weren't wasted.

It had been an inspiration to hold the trial in the Mosque. It leant an air of divine authority to the proceedings. He glanced up at the mirrored walls, designed to magnify his small band of followers and give them the appearance of an endless horde. On closer inspection, though, he noticed that the cheap film used to produce the effect was beginning to pit and peel. He made a mental note to order it changed.

He hurried from the building and across the street to a workshop. He inspected the immense dais, its intricate carving inlaid with precious metals that the workmen were assembling. It was far from complete. He located the foreman.

"The verdict is in, Mirza. I want the executions tomorrow. I assume it will be ready."

The foreman looked nervous. "You expect a lot. I had to scrounge almost every bit of decent wood on the planet. These weeds are barely old enough to harvest."

"Have it done, Mirza, or you can expect to be guest of honor at the next round."

"It will be done. The finish will be tacky, and the dust will ruin it, but it will be done."

"I don't care if you have to refinish it every night until there is nobody left to execute. I intend for this to make an impression these worms will *never* forget."

17

Christen had just finished her first warm shower in days, and was getting dressed. She didn't notice the sound of a truck pulling up. She was slipping into her pants when she heard a slight commotion outside. She was about to see what was causing it when a deafening shot rang out.

Christen grabbed the pistol and a loaded magazine, and glanced out the window. There were two armed men dressed in the Shiite militia uniform pointing guns at two villagers. A third man was bending over the body of a child. Another militiaman was entering the front door of the house she was in.

Christen slipped the magazine into the pistol, snapped the action to load the first shell, and flipped off the safety. She heard doors crashing open down the short hall and felt the a-

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drenalin squirting into her veins begin to burn. A second later, her door burst open, followed by a boot and an armed man. The soldier glanced around the room. When his eyes met Christen's, she fired, hitting him exactly between the eyes. The back of his head erupted into a spray of blood, four large pieces of skull, and dozens of small chunks of brain, which hit the bedroom wall making a stain a meter across.

Without hesitating, Christen turned to the window. With one kick she knocked it from the frame. The two soldiers holding the prisoners turned to look, and a second later, both lay twitching on the ground, victims of identical wounds.

Christen ran down the steps and out into the yard. "How many more are there?" she yelled at the men who had been held.

"Just one," came a voice from the house next door.

Christen whirled and pointed her weapon at the doorway from which the voice had come. A young Quaker man was dragging an unconscious Shiite through it, pieces of chair still wrapped around the soldier's head. Christen began to tremble, and gently lowered the pistol, switching the safety on by reflex.

She looked at the fallen child and the man sobbing over him. "Jeremy, oh my God, no, not Matthew!"

Jeremy looked up. "He saw they were going to take me away. He tried to stop them." Jeremy looked back at his son. "He was only six . . . only six."

"What do we do now?" one of the former prisoners asked the other.

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"Now the whole army is *sure* to come."

"We need to evacuate. Quickly, round up every vehicle you can, and load up the emergency supplies," replied the other.

"Wait a minute," Christen said, fighting off the numbness that was settling in after the adrenalin overdose, "aren't you going to fight?"

The men looked at each other. Christen could tell from the glances they exchanged that this had all been considered many times before, and at painful length. The first slowly picked up a rifle from one of the fallen soldiers, and the second followed suit. The young man who had taken care of the fourth soldier emerged seconds later from his home bearing a rifle, and stooped to remove a gunbelt from his victim, which he handed to another man.

Jeremy kissed his son's forehead and laid him gently down. "Is there one for me?"

"In my room," Christen answered. "Plan B?"

Jeremy stood, took a wrinkled handkerchief from his pocket, and dried his eyes. "The *original* plan. The man who gave Hab the pistol thought it could be used in just this way, if we could find someone who knew how."

Christen recognized the freighter commander's prophetic plan, which she had read in Hab's diary.

18

The following morning was unseasonably cool and dismally grey. A few dense cells imbedded in the overcast rumbled in the distance, threatening rain. Hab brought his van to a stop near a sentry guarding the path to a barren, rocky hill overlooking an immense field outside of Akka. He began gathering gear from the rear of the van. The sentry approached.

"What are you doing here? This area is off-limits."

"Except to camera crews. Al-Hariri wants good coverage, and the best vantage is up there."

The sentry looked the equipment over, poking his rifle muzzle at the cam-corder and generator. His gaze locked on the maser. He flipped it over and peered at the telescopic sight. "What's this?"

"My comlink. Break it and we'll reserve that post right down on the end for *you.*"

The man put it down gently. "Why the sight?"

"To line it up with the receiver, of course." Hab's condescending tone appeared to have the desired effect. The man stuck out his lower lip and nodded.

"Here, you can carry the generator." Hab picked up the camera, two tripods, and the maser. He reached for his lunch box, but knew he would have no appetite. He took a canteen.

The sentry laid down his weapon and picked up the generator. "Why do you need one so *big?*" he grunted.

"It's the only one they had left."

They reached the site Hab had in mind, and set the gear down. Hab began making connections, and the sentry watched. Hab scowled at him. "Where is your rifle? Get back to your post!"

The sentry scurried away, happy to

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still have his skin. Hab set up the camera on the larger tripod and the maser on the smaller. He switched on the fusion source, checked the power, and tested the equipment. Everything worked. He surveyed the scene with the camera on telephoto. Two towers of scaffolding had been constructed, and each had a camera crew on it. Workmen were busy setting up a huge dais adjacent to the five posts to which the condemned would be tied. Crude bleachers faced the dais from the opposite side of the field of fire. An empty mass grave, much smaller than the three others Hab knew were in the field, was freshly dug nearby.

Hab tried to relax. He looked at the sentry, who was busy trying to look sentrylike to assure that no infidels could slip past him unnoticed. At least *that* fool would not be a problem. As long as a second cameraman didn't show up, and nobody noticed that an unauthorized person was on the hill, this might just work.

Hab checked his watch. There were hours to go. He noticed a truck coming from the city, and watched it pull up. Soldiers in dress uniform emerged, each carrying a white rifle. Hab doubted it was an honor guard. He lined the maser up on the group and studied them through the telescope. Each wore a traditional headdress with a piece of cloth to cover his face, though most were letting theirs hang for now. One soldier caught Hab's eye. He tried to remember where he had seen the man who was rubbing his jaw.

"The Barbary pirate." Recognition of the man brought back a memory which made Hab instantly nauseous.

A frantic-looking man checked over the dais, pointing to various last-minute details and setting workmen to fix them. Hab chuckled, wondering if he could guess what the incentive plan was. More trucks appeared in the distance as the workmen picked up their tools and carried off the scaffolding.

The trucks contained prisoners and guards. The disorganized mass of condemned men and women disgorged by the vehicles quickly formed into an orderly column of ten rows of five each. Only a little persuasion with rifle butts was needed. Hab noticed that there were more prisoners than soldiers.

Half an hour later, a column of cars approached. Hab spotted the one flanked by the most security, and followed it with the scope. When it stopped, a solitary figure emerged whom Hab recognized instantly. A series of emotions, from hatred to guilt to loneliness and finally to depression, emerged from Hab's memory and crawled over him like garden slugs.

19

Al-Hariri climbed his new dais and admired it. The immense emblem of crossed golden swords with fire and arrows was his own design, and he had to admit, it was impressive. The inscription around the periphery was singularly appropriate for the occasion: "Death to the Unbelievers."

He studied the rest of the scene, then frowned at his aide. "We should have put a camera up there." He

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pointed to the hill where Hab was stationed. He raised his binoculars to look for a good location, and saw a camera already there. "Good. At least not *everybody* I'm surrounded with is a complete idiot."

His aide let out a quiet sigh of relief, and silently blessed whoever had the foresight.

20

Half an hour later, the preparations were complete. Two hundred witnesses had arrived. They were a nervous-looking bunch. Hab guessed most of them were slated to live, if they took the lesson of the day to heart.

"Ah, but whose lesson?" Hab turned the maser back to Al-Hariri, who was looking over his speech. "Prepare for hell, you poor son-of-a-bitch."

Hab was checking the aperture setting on the maser for the tenth time when the words he had just uttered came back to haunt him. How cold-blooded had he become? He sounded like one of the killing machines from an old Hollywood blood-and-guts adventure movie. An image of himself in the role of Dirty Harry flashed to mind, and sent a chill down his spine. The nausea he'd been fighting became suddenly worse.

Al-Hariri began to speak, and Hab started to adjust the sight to line up perfectly with his target's head and torso. He verified that the power was at 7 percent, just enough to kill the man quickly without making the cause of death obvious. With no means to generate a lightning bolt from above, Hab was hoping for timing and the similarity to the Mihdi's demise to carry the suggestion of an act of God. Doubt among the radicals and faith on the part of the moderates should do the rest, as it had before.

Hab had difficultly aiming the maser. His hands were shaking too much, and there was a burning sensation in his belly. He held his breath, tried to focus on the task, and finally succeeded. He listened to Al-Hariri's speech on a small radio in his shirt pocket. He tried to concentrate, but he had difficulty following the words.

The first row of prisoners were brought forward and tied to the posts. Hab readied his finger on the switch that would turn on the maser. As Al-Hariri began the command to fire, a searing pain ripped through Hab's torso, causing his hand to slip, and ruining the aim of the unit.

A loud crack rang out and echoed in the distance as Hab fumbled with the maser before doubling over in pain.

He tried to get up. People were dying while he belly-ached, but trying to move only made the debilitating pain worse. Finally, his stomach heaved and clear fluid streaked with blood shot from his mouth. The pain subsided enough for Hab to fumble for the canteen, and pour some water into his mouth. It came back up as soon as he swallowed it, but the pain was reduced to a bearable level.

Hab became aware of a strange commotion from the assembly, so loud that it came as much directly from the crowd as from the radio. He eased himself up to look. The con-

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demned prisoners were still standing against their posts. The witnesses were all standing and seemed to be in a state of confusion. The guards and the firing squad had someone on the ground. A man lay on the dais where Al-Hariri had stood.

The pain had subsided enough for Hab to re-aim the maser. He swung it around to the man on the dais, who had a medic and about a dozen soldiers hovering over him. The bodies parted long enough for Hab to verify that it was Al-Hariri, and without a doubt, the man would order no more executions. The splattered blood glistening on the backdrop suggested the shot had come from the firing squad.

Had turned the telescope on the mob scene where the firing squad had been. The guards were raising a man to his feet, with his arms pinned behind him. As they dragged him toward a post and ripped off the headdress, Hab recognized the Barbary pirate. One prisoner was dragged away to make room for a new assassin.

Hab was confused, but as the soldiers cleared away from the posts, an idea came to mind. As the firing squad was preparing to shoot, he trained the maser on the gold-inlaid emblem above the dais, turned the power up all the way, and switched it on.

Hollywood could not have devised a more spectacular or fitting effect. Sparks flew from the metal decorations, the emblem began to smolder, and finally it burst into flame. Within seconds the uncured finish had spread the fire until the whole structure was engulfed. The firing squad was completely distracted from their duty. The crowd of witnesses began to mill. Several moved toward the prisoners, scuffled with the few guards still at their stations, and began to free the condemned.

A small thundercell overhead completed the effect by emitting a low rumble. Minutes later, heat from the burning dais rose into the cloud, increasing its intensity. It was not a particularly large thunderstorm, but the thunder spurred the rest of the crowd to action.

21

Hab noticed a lookout with a rifle standing on an outbuilding as he neared Lancaster. He stopped and picked up his binoculars, fearing an ambush by the militia. He relaxed when he recognized the sentry as the village historian, but realized the village must have had its own adventure in his absence.

Ben smiled when he recognized Hab, and again when Hab held up the camera, unharmed. After checking the back of the van to be sure there were no radicals holding a gun to Hab's head, the historian waved him on.

As Hab drove into town, he attracted little notice. He and the van were recognized quickly. The villagers seemed to have more to worry about. Hab pulled up in front of Jeremy's house, noticing dark stains in the parking area in front of the van. As he emerged to investigate, Christen burst from the house and ran to him, embracing him warmly. Hab hesitated, confused and uncomfortable at

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the unfamiliar display of affection, then timidly began to return the hug. Christen felt warm and good, and he realized that he never wanted to stop.

"Easy, tiger," Christen gasped as the bear hug began to interfere with her breathing. "Before you see Jeremy, I need you to come with me. There are some things I need to explain." She took Hab's hand and led him away from the houses toward a peaceful grove of young trees across the fields.

Hab motioned toward the sentry, and another he had just spotted in the loft of a barn. "You had visitors. I caused this. They were looking for me."

"No!" Christen exclaimed. "Absolutely not. We interrogated one of the soldiers. What we were told makes us believe the choice was entirely random. They came out here with the same warrants for spying and conspiracy that they're using on everyone else. The charges were printed and identical, with the names left blank. They apparently intended to grab anyone who looked like a community leader just to make sure the rest stayed in line."

Hab noticed another sentry. "The Friends were ready to start a revolution. I can't believe how badly I bungled this. It is pure luck that I didn't start a war."

Christen stopped, grabbed Hab's hand, and spun him to face her. "I watched the whole thing on television. I *saw* what happened. I don't know *how* you can think you bungled it. You were absolutely *brilliant.* It's really a shame we can't tell the world about it and hold a big parade. Hab, you are the kind of hero they sing songs about for a thousand years."

"I didn't do anything. That fellow in the firing squad did it. He is the hero. I folded up. I couldn't do it. If it wasn't for him, all those people would have died, and Al-Hariri would still be in charge."

"What do you mean, you folded up?" Christen asked.

"I literally doubled over with a belly ache."

"Then who started that fire?"

"Well, I did *that.*"

"Ahmed gets the credit," Christen admitted, "but without you, he would have just been killed, someone else would have taken Al-Hariri's place, and maybe an extra thousand people or so would have been executed in the witch-hunt." Christen put her hand on Hab's forehead. "How are you feeling now?"

Hab shrugged. "Fine. Probably just a stomach virus."

"We'll see what the doctor says about that," Christen replied. "In the meantime, I'm really glad things worked out this way. You didn't have to kill anyone, your special effects convinced the onlookers that the assassination was God's Will, and the bad guys have been routed thoroughly. Quite a riot you started."

"I had some help from nature," Hab replied. "The storm was what did it, I think. Several people knew I was up there. They might *still* figure out what I was doing there, and how the fire started. That would be a disaster."

"Quit thinking so much," Christen chided. "They believe it was an act of

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God because they *want* to. That whole show was staged to bring people who *knew* Al-Hariri was evil into line. You told me yourself that they are basically very good people. You just gave them the conviction to show how true it is."

Hab suddenly realized where Christen was taking him, and broke into a run for the village cemetery. When Christen caught up with him, he was kneeling over a fresh grave covered in flowers. The inscription on the temporary marker read "Matthew Habakkuk Gurney."

"I wanted you to see this before you spoke to Jeremy," Christen explained. "Matthew tried to save his father. Jeremy was one of the ones they tried to take."

"I know exactly how Martha and Jeremy feel," Hab said softly. "Exactly. Christen, how can people do this to each other? No, wait, who am *I* to ask that question?"

"There's a big difference between you and the Mihdi, Hab, in case you haven't figured it out. You killed in self-defense, or in defense of others."

"That was his claim, too. Christen, you don't know what this is like to live with."

"Quit feeling sorry for yourself. Get up, I need to show you something else." She led Hab to three undecorated graves in the rear corner of the cemetery. "These are my work."

Hab looked at Christen in disbelief. "But how . . . Jeremy gave you the pistol?"

Christen nodded. "Funny, when you grow up with guns, at least if you're trained properly, you learn not to think of them as a solution to your problems. They are highly specialized tools, and you come to know that if you treat them as an easy fix to any problem that comes up, they are more apt to destroy than to repair. But there's always this secret fascination, a fantasy, that one day you'll get to be the hero, coolly blowing smoke from the muzzle after doing in the bad guys. The fantasy never shows the part that comes after. These three were a little younger than me, and they'd probably never been in action before. They probably shot Matthew because they were too scared to think. Now I have trouble sleeping, too. Come on, this place is giving me the creeps."

They started back toward the cluster of homes. Hab pondered what Christen had said. "How do Christians deal with something like this?"

"You're asking the wrong person," Christen responded, "but the answer is probably universal. I guess you just sell yourself the facts, convince yourself that it was the only choice, and learn to deal with the nightmares the best way you can. I can say this much: if I had to do it again, I'm not sure I could pull the trigger."

Hab reached for Christen and drew her close against his side as they walked slowly back to the village. "Mind if I make a suggestion, something I just learned? Find someone who's been through the same thing you have. When that person tells you that you did what you had to do, it's a lot more convincing than trying to sell it to yourself."

* * *

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22

Something uncomfortable poked at Hab from a pants pocket. He reached in and withdrew it. It was the package Jeremy had said was from his father. He opened it, to find a letter and a key to the Sunfire. He read the letter.

Dear Son,

I know we have grown apart, and that we no longer understand each other. I realize, though, that we are still father and son by more than just blood. The title of Vazir means "burden-bearer," and it is a title you have earned more than I.

Your project appears to be coming along splendidly. While I can still hope that the efforts of myself and others will make it unnecessary, I will confess that we all harbor secret doubts from time to time, and are grateful that we now have a place of refuge. I can see in your work the inspiration of God.

I still cannot fathom why you will not see me. I hope it is only that you fear I hold your taking the Sunfire against you. Perhaps my little gift will convince you otherwise. We have so much to talk about, and so many wounds to heal, and most of those wounds are the doings of others.

Until we can be together again, then, go with God, confident that He is always nearby, and that you are in His heart. Trust Him always, for He is sure to grant us peace and brotherhood, if only we will give Him the chance.

Your loving father,
Husayn

* * *

23

The Sunfire sat on its landing bag at the end of the village runway. Hab and Christen made a dash for it. They were both winded when they arrived. Hab took a deep breath, swept Christen up in both arms, gave her a big kiss, and lifted her to the canopy.

"Wait a minute," Christen cried, "Let's get this off first." She dusted rice from her clothes and shook as much as she could from her hair, then did the same for Hab.

"OK, in you go," he said as he slipped her into the cockpit.

He ducked around the back, giving the ship a quick once-over. Tied to the tail, he found a string of cans. "What in the world is this for?" he asked, holding the decoration as high as he could for Christen to see. He could hear children giggling from the brush nearby.

"Another silly tradition," Christen replied. "Leave it on unless you think it's unsafe."

Hab trotted to the front and climbed in. "I guess it can't hurt anything, but it won't last long when I throttle up. Ready, Mrs. Safwat?"

Christen cranked the canopy forward. "Ready." As she kissed him again, a shower of rice fell on the canopy.

"Then let's get out of here." Hab turned the key, checked the systems, made sure the area was clear, and eased the throttle forward.

The Sunfire was heavy. Its reaction mass tank was full of seeds and supplies, as was the back seat and luggage compartment. Despite a prior soaking from the irrigation system, the ship's

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exhaust plume left a trail of smoking grass down the length of the runway. There was little cause for concern about snooping enemies. The radicals, or rather the few that remained, were in hiding, and the three freighter/warships were scattered throughout the system, each apparently in the throes of internal turmoil.

Shortly after becoming airborne, Christen's computer reminded her of the schedule. "Time for your medicine," she chided, pulling a bottle from a bag beneath her seat.

"Ugh, I *hate* that stuff." Hab grimaced as Christen carefully poured a spoonful of chalky liquid.

"The doctor says it's all we can get until we reestablish contact with Earth," Christen said as she slipped the spoon into his mouth. "So be a good boy and take care of that ulcer. And don't worry," she slapped a carton behind the seat, "there's plenty more where *that* came from."

"I just wish he'd let me eat more interesting food," Hab sighed.

Christen pulled a piece of paper from her bag. "Wedding present from Jeremy. The doctor said it's OK, if I leave out the pepper."

Hab's eyes lit up. "'He gave it to you?"

"Brunswick stew, per the old Virginia recipe," Christen replied, "if you allow for freeze-dried chicken."

"I think I'm going to like married life," Hab observed. He pondered for a minute. "I confess, though, to feeling a little dishonest about the ceremony."

"Hm?" Christen was alarmed.

"It was a Christian ceremony. The Baha'is believe strongly in Jesus of Nazareth, but most of us don't know much about formal Christian teachings. I feel like a phony after saying all those I-dos without knowing what they all meant."

Christen was about to suggest that they have a Baha'i ceremony, when she recalled a passage from her childhood. "OK, then, I'll teach you Christianity. 'Thou shalt love the Lord thy God with all thy heart, and with all thy soul, and with all thy mind. This is the first and great commandment, and the second is like unto it: thou shalt love thy neighbor as thyself. On these two commandments hang all the law and the prophets.' There, that's Christianity. Easy to say, difficult to live by. You can memorize volumes, and quote them chapter and verse. Forget these words and you are a lousy excuse for a Christian. Live by them, and you cannot help but be a good one."

"That's not too different from the Baha'i Faith," Hab said at last. "Or, I suspect, any of the great religions, including Islam."

As they headed for the coast, Hab described the southern camp with its flowers and hummingbirds that would be their winter base of operations. It sounded delightful.

"Hab," Christen interrupted as they neared the mesa, "I want to see that canyon again."

Hab turned the Sunfire toward the gap in the plain, visible in the distance. "That place depresses me. Why do you want to go there?"

"Call it my wedding present," Christen replied.

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They swooped through the canyon, this time with Christen giving the narrative tour.

"Notice the even spacing of bands. The crust of this planet has never been disrupted. Al-Hariri and the Mihdi allegedly planned to use a skimming pass by a starship to set up an explosion in the atmosphere of Earth which would have totally jumbled the crust and flooded large parts of the planet with magma. Their attempt failed because the crew was not about to let something so unthinkable happen.

"Now beside the ship you see a distinctive two-tone band. An ancient civilization used this planet for a few hundred years, then destroyed its artifacts and covered the planet with ash. This was apparently repeated twelve times. Each layer of ash looks about the same. Each civilization used the same method to erase itself from Mazra'ih. The method does little physical damage to the planet, but it destroys all life. I'd guess they used highly radioactive short-lived isotopes like cobalt 60, or something comparably deadly."

The Sunfire cleared the canyon rim. "Now we come to the present, or rather a few decades ago. The planet was found by us, lifeless. And yet, you say that the passage through Hellspiral wouldn't extinguish *all* life. Each civilization carefully and deliberately sterilized the planet, knowing that the next one to come along would probably not permit itself to use this world if life were already here."

"But why do they only last a few hundred years?" Hab protested. "They could stay for *thousands*. Something is unstable about this place."

Christen shook her head. "The problem, if it *is* a problem, is not with the planet. Any civilization which reaches Mazra'ih is capable of star travel. In fact, to have a significant chance of *finding* it, the civilization has almost certainly developed c-prime. The evidence suggests that civilizations like that quickly disappear."

Hab looked his wife squarely in the eye. "You expect *that* to cheer me up?"

"Who knows what happens?" Christen replied. "I didn't say they destroy themselves, though, just that they seem to vanish. Maybe it's the Second Coming, or Armageddon. Maybe there's another civilization out there that feels threatened by c-prime technology. I don't think it's any of those things. When I look back at the last two hundred years and all the advancements we've made, and if I plot them on a graph, the trend goes so near vertical a short time in the future, all I can really say is that the future is so fantastic, nobody alive has any real idea what it will be like. I think it was Vernor Vinge who called it 'the singularity.' Whatever you call it, I can see that, as need and hunger are eliminated, there have been fewer wars, and as we learn to live together peacefully, our progress accelerates."

"So you think maybe they blink off into another dimension or something?"

"Or something," Christen nodded.

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"At least I like that explanation a lot better than the idea that they blow themselves to bits."

Hab banked the Sunfire into a shallow turn and circled over the canyon, looking down at the shattered city imbedded in its walls. "I think I like it better too."

They landed at the same spot they had used on the trip in, and held a picnic amid a jumble of alien artifacts. After a romantic meal, with silver goblets, unlit candles, and a rose in a crystal vase, Hab lay back to admire the beauty of the afternoon.

"Christen, I think I've found something to believe in."

Christen snuggled beside him. "Tell me about it, my love."

"We were raised to worship a God who is all-powerful and all-good. Tell me, why would we worship such a being? The power, or the goodness?"

"The prudent," Christen replied, "would fear the power, I suppose, but I'd like to think you'd worship this God because of the goodness. Is that what you think?"

"Exactly," Hab answered. "I think what the God Moses, Christ, Muhammad, and Baha'u'llah taught about, if He exists, is good because He *has* to be. He is Zoroaster's Ormazd, the universal spirit of good, battling the loathsome Ahriman. If it were not for that goodness, He would not be worthy of worship. His greatest power is the power to elicit love, out of respect for His goodness."

"I'll buy that." Christen put her head on his chest.

"If Al-Hariri were all-powerful," Hab continued, "and were Master of the Universe, he would not be worthy of worship, simply because he was so full of hatred. But even if Al-Hariri were omnipotent, I could still love goodness. I think what I'm saying is that, even if God does *not* exist, He *ought* to. If this all-good God *does* exist, I suspect he will forgive unbelievers like us who have tried our best to do what is good. Either way, if I live my life according to how this God *ought* to want me to, I don't think I can do any better."

Christen sat up on one elbow, kissed her man, and gazed into his eyes. "Don't you think that is what you have been doing?"

"I'd like to think so. I wish I could be sure. The only catch with this idea is that I have to decide what's right without having God's wisdom. But, I suspect that is probably the master plan anyway. The last few days, though, I've been having some doubts I'm a lot happier about."

"Oh? What doubts?"

"My dumb luck. All those coincidences that saved this world from war. That thunderstorm, in particular. Falling in love with *you*. I'm starting to doubt that God *doesn't* exist."

They lay there enjoying the day until the setting sun and the evening chill forced them to dig out the sleeping bags. ■

EDITOR'S NOTE: This story is a sequel to "The Devil and the Deep Black Void," which appeared in our January 1986 issue.

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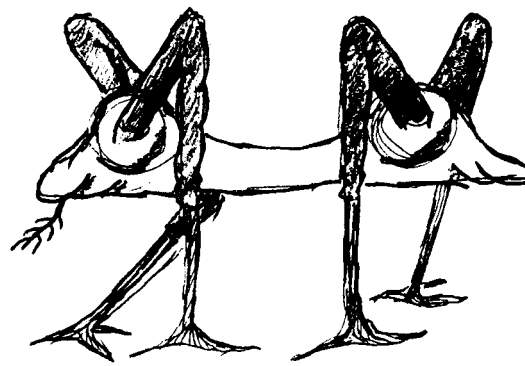
[Throop & Sons, Marsport, Krasnia Rep. (2394 A.D.)]

From the Travel Diary and Sketchbook of Braxton Montague Shew III



The Common Argoen Of Huang's World

Mater Dearest,

Our stopover on Huang's World was brief and pointless, save, I suppose, to the scientists at the outpost for whom our vessel was carrying supplies. However, it did provide the opportunity to observe a curious local creature called a "common argoen" [sketch enclosed]. Billy Bob Huang himself entertained us while the supercargo saw to the deliveries. He explained that the creature has universal joints for its knees, so that it can walk forward or backward with equal ease. Its underbelly is colored the same pale crimson as the skies of this world, so that the small creatures it hunts do not realize until too late that it is looming above it. At the crucial moment, the argoen flexes all of its knees and drops flat to the ground; and the hard, bony plates of its underbelly snap and break the limbs and spines of its quarry. The argoen then feeds at its leisure on these "chiggenlils." There must be subtle differences among many related species of this unusual predator for, when we espied one in the distance and asked Billy Bob about it, he said he did not know if it was a common argoen.

Sincerely,
Brax

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Dr. Gay E. Canough

WORKING UP TO SPACE SOLAR POWER

A few months ago, I was talking to one of my colleagues about solar power collecting stations in space. "Oh," he said, "that old saw. You mean people are still talking about that solar power satellite business? I thought everyone knew by now that it is just too expensive to do such a project."

What he was referring to is the idea of building large solar power collecting satellites in geostationary orbit (GEO). Such a satellite (known as SPS) would be made of kilometers of solar cells. The collected solar energy would be converted to microwaves and beamed to a large (perhaps 10 km in diameter) rectifying antenna or "rectenna" on the ground. Of course a satellite in geostationary orbit would point to the same place on Earth all the time. These types of solar power satellites were proposed in 1968 by Dr. P. Glaser [1]. Most people interested in space activities or science fiction have heard of these SPS's. They are appealing, even today, because they offer a means to generate clean power. In GEO there are no clouds to worry about. In orbit a large, lightweight structure could be built. With a 10 × 5 km array a large SPS could send a few billion watts of power down to Earth all the time except for about one hour per day, when it is in the Earth's shadow. Microwave beams would have low power density, so as not to fry anything flying through the beam. The 5 × 10 km, 5 GW station is the so-called "reference system."

There is a huge pile of information on the reference system. The Department of Energy and NASA funded ex-

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tensive studies on it in the 1970s. There are tens of thousands of pages documenting these studies [2]. Twenty million dollars of the taxpayers' money was spent on the studies. And so, you would think, if SPS is such a swell idea, then why is most power still generated by filthy fossil fuel burning?

The biggest problem with building such large power stations is that lifting all the materials needed from Earth to GEO is way too expensive. With our current launch vehicles, launch costs would be around $500 *billion* dollars for the "reference system." Still, that problem could be circumvented by using lunar materials, lowering the transportation costs by an order of magnitude. Research funded by the Space Studies Institute [3] demonstrated that the Moon would be a feasible source for the necessary materials (mostly aluminum and silicon, of which the Moon has plenty). What has not been figured into this good idea is the costs of developing a lunar mining station and materials processing plants in space.

There are all kinds of other problems associated with building large power stations in space. People would have to work in the harsh radiation environment to build it (or at the very least, repair broken construction robots). If microwave beams are used, they will cause (probably unacceptable amounts of) interference to communications satellites and ground systems. Power beamed by lasers has its own set of problems, like clouds getting in the way. What is the environmental impact of beams coming down to Earth? On people? On the atmosphere? And what about space debris? A large structure would a) be a source of debris (in the valuable GEO) while under construction and, b) be a large target once finished. Would maintenance on the finished power satellite require humans on station at all times?

I could go on for pages about the problems (OK, call them challenges) of building SPS, but there is a more fundamental point to be made here. Let's face it, starting out a space solar power project with this large and difficult SPS is like trying to build a Saturn V rocket before trying out a V2. Dr. Glaser himself has advocated a stepped approach to building such large stations. Space solar power systems we have built so far include those solar arrays on communications satellites and some one-of-a-kind systems like what was on Skylab and is on the Hubble telescope and the Russian Mir space station. Compared to the 50 square kilometer array of an SPS, what we have done so far is *puny*. We know very little about constructing large structures in space. Sure, lots of studies have been done on it, but we have not actually built anything. All space stations built to date are very small. Even the cleverly expanding Mir is not much larger than the old Skylab. (Americans sometimes sneer at Mir, but it has one clear advantage over Skylab: it is *in orbit.*)

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New Paradigm for Space Solar Power

In the past five years, discussions of space solar power have taken on an entirely new flavor. There is a dedicated group of researchers worldwide who have been doing quiet studies on various aspects of space solar power. New types of solar cells are being invented, new means of solar to electric conversion have been proposed, laser power beaming has been looked at and large deployable solar arrays have been used on communications satellites. (The largest solar array yet deployed is on the European communications satellite, Olympus. Its 2 panels are each 14 × 3 meters.) At a space solar power conference last year in Paris, researchers were collectively saying, "Wait a minute! We don't have to build large SPS's at the beginning. We don't even have to build in GEO, and so these stations could be *much smaller*."

In addition, there is a strong undercurrent that space solar power could be a business venture rather than a science project. People are now talking about a power utility in space. At the conference, there was a session devoted to demonstration projects. These projects involve building solar power stations in low orbit. Such stations would generate anywhere from 100 kW (scientists intending to use the space station Freedom would be ecstatic for this much power) to 10 megawatts (enough power for a small developing nation).

The size of the solar arrays for the 10 MW station is 100 × 800 meters (80,000 square meters). Compare this to arrays on the Hubble telescope (4 panels, each 2.4 × 6.45 m, give 4.4 kW) and on the Olympus communications satellite (2 roll-out wings each 14 × 3 m, give 7 kW). According to solar array designers at the European Space Agency (ESA), who made the above mentioned arrays, the next step is 100 to 300 square meter arrays capable of 10 to 30 kW power generation. So you can see that the manufacture of solar arrays for a 100 kW solar power station is just around the corner. In fact, the deployable solar arrays in use on real spacecraft could be hung on a modest structure now to make a decent solar power station.

Of course, using more efficient solar cells will reduce the size of these arrays, and hence the mass. If solar cells on the Olympus could be replaced with 30% efficient cells, the size would be cut in half! Launch costs being high, solar cell researchers are working furiously to perfect the more efficient types of cells as soon as possible. In another technical area, the efficiency of converting electricity to microwaves or laser, and back, is on the rise. New magnetrons (devices for converting electricity to microwaves) for use in space have been developed. Means of converting sunlight to electricity, other than photovoltaic solar cells, have been tested.

Experimental platforms can transmit power to Earth, but a new market for beamed power is for use *in space*. Already, scientific research in space is significantly constrained by lack of power. Designers of new space facilities, such as the US Freedom space

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station, are engaged in continuous debate on what size power plant is affordable. Every working satellite in space has some type of onboard power plant. This situation is analogous to conditions in the 19th century, when each household burned coal for heat and each factory made its own electricity. Centralized power cut down on pollution and cost. The latter is very important for space projects. In some cases (spent nuclear reactors) pollution of space is also a problem. It may be less expensive in the long run to have centralized power stations in space for power needs in space.

Demand for Energy and Standard of Living on Earth

Now what about *Earth?* As Dr. G. O'Neill of the Space Studies Institute in Princeton, NJ, pointed out in a recent article [4], the standard of living for humans is critically dependent on availability of power. How does the amount of power available affect the standard of living? First, what do you define as a standard of living? It has to do with the quality of your life. How much must you work in order to provide the necessities (food, housing) to yourself or your family? What other goods can you afford to make life more comfortable? How much leisure time do you have? Do you have to work 18 hours per day to get the basics?

How much you have to work depends on what kind of job you can get based on your education and skills, and if there are any well-paying jobs where you live. But what creates good jobs in an area? The area has to be attractive somehow to an industry. Some factors that will influence a company's decision to locate a factory in a certain place include the local taxes, the local talent, access to main transportation networks, and power. In the USA, we usually don't worry too much about power, since it is available everywhere (albeit some places are more expensive). But in many places on Earth there is not a power plant for hundreds of miles, if at all. How can there be any industry in such places? If there is no industry, how can people get jobs?

High tech industry is not always necessary to have a high standard of living. Many agricultural communities live very well. Still, agriculture is a type of industry and as the population increases, farming must become more efficient. This has tended to lead to the need for power on farms, for milking machines, tractors, and a hundred other necessary tools. There is also the problem of good farmland. There are places where the local environment is being destroyed to get more farmland.

As more nations raise their industrial bases and their standards of living, they are going to need more power. How will they get it? At present they plan to burn fossil fuels, just as people in the US do. What other choice have they? Nations with nuclear power capability tend to keep the technology to themselves for the (legitimate) reason of nonproliferation of weapons. And how much power are we talking about? The US population uses 60+% of all the

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power generated in the world. But the US has only 5% of the world population. This means that even if we are very conservation-oriented and we teach the rest of the world to save energy too, then if the rest of the world were to rise to the US standard of living, the power demand would be almost 10 times what it is now. And that does not take into account the growing population. According to the UN medium growth model (1% per year), the world population in 2020 will be around 7.8 billion. At the current growth rate of 1.7% per year, the population will be 10 billion [5]. Many of you *Analog* readers are still going to be alive in 2020. What will the world be like? Even if there is enough coal and oil to support this power demand, will we be able to burn it without *suffocating ourselves?* The need for clean energy for Earth is a real, even pressing, demand.

Many of the proposed demonstration projects could also be used for power beaming to Earth. By storing power and only beaming it when over the receiver, stations in low orbit could be used. These smaller stations have some of the same problems the larger ones do, but the point is that they can be built now. Thus governments and power companies would start up the learning curve gradually. They could learn how to build moderate-sized structures. They could learn more about the actual interference problems and the environmental impacts and find ways to mitigate these. Power companies could work on how to make space solar power competitive in cost to terrestrial power plants.

All the knowledge gained in doing the demonstration class projects can then be used to build second generation power stations which would be larger and provide still more power, until one day, the 50 square kilometer, 5 gigawatt power stations could be built. But from where we are now, what this large SPS might be like is anyone's guess. The technologies that will emerge from a space solar power program might be beyond our imagination, even if the idea of the big station is not. Imagine the designers of the IBM 360 computer speculating on the eventual existence of the PC. Yes it will come, but who could say that a transistor would shrink to a few *microns* in size, that the computing power of an IBM 360 could fit into one 80386 microprocessor? Imagine the surprise to a computer programmer from 1960 who is suddenly transported to 1990 and put in front of a computer you just *point and click* to use?

Development of Space Solar Power

Space solar power has much promise, and serious development programs are now being designed and implemented. Dr. Glaser has been promoting a stair-step approach to space solar power for a number of years now, and we must now fill in the details of each of the steps. There is a spectrum of issues to be researched before even a medium-sized power plant can be installed in orbit. These are not only engineering questions, but also legal, political and business questions. During the 1992

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summer session of the International Space University, students spent 10 weeks researching these questions and determining what are the really key items and what would be a reasonable set of demonstration projects. The details of this work can be found in their final report [6].

Solar Power Station Basics

The basic space solar power station will collect solar energy by using photovoltaic arrays or by heating fluids to drive turbines and generators (solar dynamic). All of our experience in space to date is with photovoltaics, so chances are that the very first space solar power plants will use photovoltaic arrays.

Once the energy is collected it has to be transported to Earth. The way we transport energy from power plants on Earth is to convert it to electricity (turbines turn the generators) and then send it down wires to your house. The electrical energy is sent at high voltage and low current to lower the resistive losses in the lines. We could use an actual transmission line from space only if the power plant was in geostationary orbit. The difficulty with this is that the transmission line would be 36,000 km long and making such a long cable with sufficient strength would be, if not impossible, too expensive!

Someday, there might be a waystation/power plant up there with an Arthur C. Clarke-type elevator attached, and a cable would just be part of the larger structure. Until then, there is an easier way: *power beaming*. Power beaming is the transmission of energy through free space by means of a collimated beam of electromagnetic energy. If you want to receive the energy on Earth, you must pick wavelengths that the atmosphere is transparent to. Based on this criterion, centimeter microwaves would be a good choice. Laser beams at infrared wavelengths would work also. Even millimeter microwaves will work fairly well, with some losses by absorption in water. As we will see, there are advantages and disadvantages to each of these. In any case, we beam the energy down somehow and collect it at a ground receiver. If the beam is microwaves, the receiver is a rectifying antenna. If the beam is a laser, the receiver is a photovoltaic array.

Key Issues

Part of a development plan for any new form of power generation is a list of research projects that should be done and when they should be done, preferably starting now. Most nay-sayers of space solar power will argue about the merit of particular power station types, but we have not done enough serious work yet to even pick a particular type. We should at least have a more in-depth look at the key issues before going forward or abandoning the basic idea. Although the NASA/DOE study produced a two-meter-tall stack of papers, many of the reports ended on the note: *More Research Needed.*

Power Beam Basics

A fundamental property of energy beams is that they spread with dis-

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tance. The spreading depends on four things: the wavelength, the diameter of the transmitter, the diameter of the receiver, and the distance between transmitter and receiver (Figure 1):

Diameter of Receiver = (2.44 × Distance × Wavelength) / Diameter of Transmitter

This tells you several important things:

- The shorter the wavelength, the smaller the receiver can be for a given transmitter
- The farther away the receiver is, the larger the receiver has to be, for a given transmitter diameter
- If you want a smaller receiver, you will have to make the transmitter larger, for a given wavelength and distance.

Now, whip out your calculator and plug in a reasonable size for a space-based transmitter (antennae on communications satellites are a few meters in size), use one-centimeter microwaves, and try it for low orbit and geostationary orbit. Unless you can make a transmitter tens of meters in size, the receiver is going to be *very large!* Now do the same calculation for a laser, where the wavelengths are in the range of, say 600 nanometers (that's 600 × 10^{-9}m). Notice that there is quite an advantage in using the shorter wavelength. The problem is that the largest laser apertures are only a few centimeters.

The other calculation of basic importance is the power density at the receiver: the total power received divided by the area of the receiver. Even for a 1 km transmitter at geostationary and a 10 km receiver on Earth, the power density for microwaves is only about 0.020 watts/cm^2. For comparison, a typical microwave oven has a power density inside of around 2 watts/cm^2. That's 100 times more than the power beam. Therefore, a microwave power beam

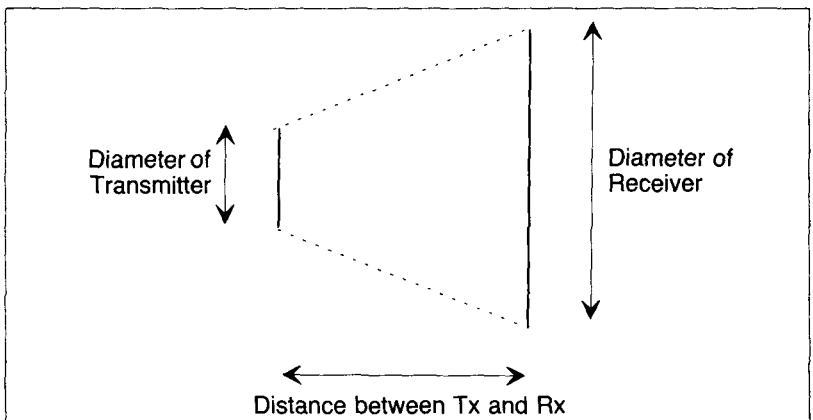

Figure 1: Beam Spreading.

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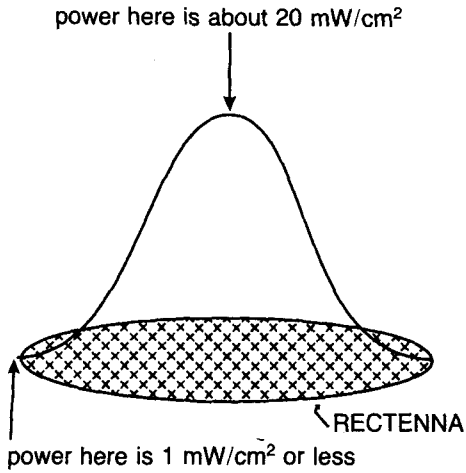

Figure 2: Beam profile for microwave beam.

would be totally useless as a weapon (Figure 2).

Most of the discussion for microwaves has been for a frequency of 2.45 GHz (or a wavelength of 1.2 cm). Microwave ovens operate at this frequency and so the magnetrons (the devices that generate the waves) are well developed, manufactured in large quantities, and cheap. However, magnetrons are heavy and a new type of generator/transmitter has been developed, the phased array transmitter. Rather than using a bulky vacuum tube amplifier, these are made of solid state devices such as gallium arsenide field effect transistors and microstrip antennae. The beam is pointed electronically rather than mechanically. Still, the largest phased array for use in space is only about 15 meters in size (Radarsat). Developing a large phased array at 2.45 GHz will be a challenge.

Interference with Communications

A problem that seriously needs to be addressed by proponents of microwave beaming is that the frequency band 2.1 to 2.5 GHz is becoming very busy with communications. Manufacturers of microwave ovens are fighting to keep 2.45 GHz for use in ovens. The problem? *Interference.* Work needs to be done to develop phased arrays at frequencies outside the crowded communications bands. One suggestion has been for 35 GHz, although there is more absorption in the atmosphere at this frequency.

Environmental Impact

A list of environmental considera-

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tions for space solar power has grown over the years. Although there are plenty of engineering challenges to be met, the question of environmental impact is more likely to stop space solar power development than anything else. This is not because it is technically difficult to learn what the environmental impact will be. The problem is that technical people get so caught up in the beauty of a system that they forget the political, social and environmental aspects. In many cases, they actively avoid worrying about issues as thorny as environmental impact. Not only do developers of space solar power have to thoroughly understand the environmental impact, they also must participate in the process of educating the utilities and the public who will buy and use the power, and who may live near a receiving station.

The question of low level effects of microwaves on people and animals has been the subject of hot debate. The literature is filled with hundreds of experiments to determine if there are any effects [7]. By low level, I mean less than 100 mW/cm^2. There is a lot of conflicting information for detrimental effects below this level. Still, the manufacturers of microwave ovens have a standard for maximum leakage of 5 mW/cm^2 at 5 cm distance (from oven) [8].

In addition to effects of microwave beams on living things, there are questions of how a laser or microwave beam would affect the atmosphere, especially the ionosphere. If we ever manage to increase our activities in space to a level where we are launching 100 times more rockets than we do now, then effects of rockets on the atmosphere will also have to be considered. Or what about generating large amounts of space debris from assembling something large in orbit? There might also be environmental problems we haven't thought of yet. Environmental impact is one of the least understood and yet most critical areas of study for space solar power [9, 10].

A Reasonable Path to Real Space Solar Power

Less Paper, More Hardware. One of the problems that seems to be permeating the entire community of space scientists and engineers is the tendency to generate more paper studies rather than build something. It is fairly easy to get funds from governments and other agencies to do a paper study. After all, a paper study will have a "safe" outcome, unlike a piece of hardware that might not work. Also, paper often seems cheaper than hardware. However, paper studies in the long run can cost more than just doing hardware development. The NASA/DOE study on space solar power cost $20 million. Yet this summer, students made a convincing argument that a small space solar power demonstration project could be done for $5 million. The Japanese space agency, ISAS, is going forward with development and testing of components for space solar power, all for a few million.

Work in Progress; Demonstration Projects

Researchers and engineers have

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now entered a new era for space solar power. We are going toward focused research and development work on various aspects of space solar power and we are keeping international communication among the different teams wide open. At least one company is working on environmental impact and there is work going on *right now* to get some small demonstrations into space, as well as doing the component research.

Within the next year, a Texas A&M-ISU rectenna will be part of an ISAS (Japan) space power beaming test *in space*. This project, known as the microwave energy transmission in space or METS, consists of a sounding rocket whose payload is in two sections. The mother section has a phased array transmitter to beam to the daughter section at 2.45 GHz. The rocket will be launched on a suborbital path and the daughter section will separate from the mother section. Power will be beamed near the

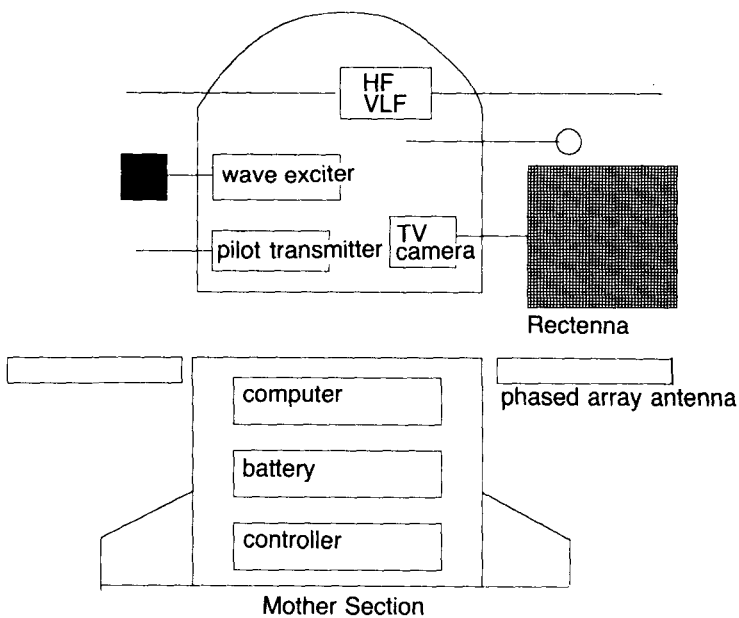

Figure 3: Microwave Energy Transmission in Space—METS Configuration of the METS power beaming experiment. Microwave energy is beamed from the mother's phased array to the daughter's rectenna. Interaction with the space plasma will be studied.

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top of the trajectory (around 30,000 meters altitude). The experiment will measure how well the transmitter and rectenna perform in space, as well as the interactions between the space plasma and the microwave beam. The plasma experiment is of interest for basic science as well as for power beaming [11] (Figure 3).

Other projects being looked into now include building a small satellite to beam power to, and a beaming test between, Progress and Mir. These small demos will give us some real experience with power beaming and help us decide what the next step should be. Funds for these projects will come from governments and power companies. (Yes! power companies have already contributed to space solar power projects).

It is difficult to see the next step clearly until the first one is done; but at some point, larger space solar power plants could be built to supply power to other spacecraft, such as the power-starved space stations, or to beam a commercially large amount of power to Earth. Some of these medium-sized demonstrations were detailed in the 1991 conference on space solar power and are outlined below. I put these in to emphasize the point that we do not have to build giant stations any time soon.

A Russian space solar power station proposed by the Research Institute of Machine Building in Kaliningrad would generate 250 to 500 kW. It would consist of a deployable solar cell array, a Progress supply spacecraft and a Soyuz type module. The

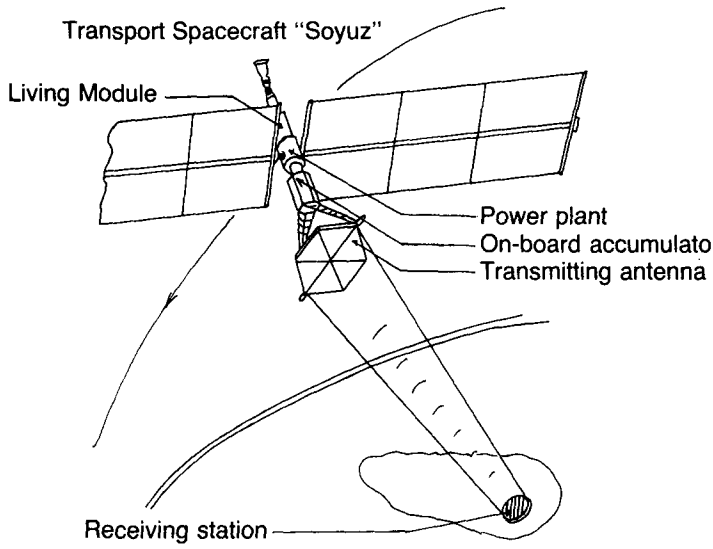

Figure 4: Russian Space Solar Power Demo (from SPS 91).

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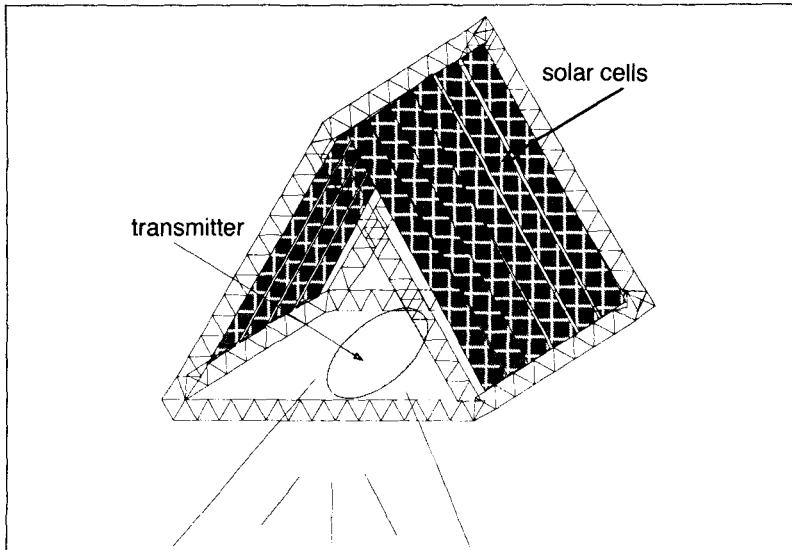

Figure 5: SPS2000 Made in Japan.

entire station could be launched on one Energia booster. The crew would live in the Soyuz while assembling and maintaining the power station. The station would be put in a low, Sun synchronous orbit. Power would be stored, for example using batteries or a flywheel, until the station was over the receiving station on Earth or near a receiving spacecraft, and then pulsed to a rectenna. The power station's antenna would be about 30 meters in diameter. The specific mass would be 270 kg/kW. This idea has the distinct advantage of using existing technology with the potential for improvement (for example in the specific mass) as new technology is developed. It could also be installed and start generating power (and revenue) in a short time [11] (Figure 4).

MBB Deutsche Aerospace has proposed a 1 MW power station. This satellite would consist of two solar panels 60 m × 200 m. It would use the electricity from the solar cells to power a laser. They proposed a laser which would operate in the infrared, since these rays can penetrate the Earth's atmosphere. The total mass of such a system would be on the order of 20,000 kg, which could be launched on one Ariane 5 rocket launcher and would have a 10-year life [11].

The Japanese evolutionary satellite power system, SPS 2000 would be a prism-shaped array of solar cells and would use microwave power beaming. Each side of the "prism" would be 100 × 800 m. This would give about 10 MW of power. The solar cells would be 1 m × 100 m strips that would be unrolled. The station would be put in a 1000 km equatorial

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orbit, store power until over the receiving station on Earth, and then beam for about 200 seconds on each pass. At that altitude, the transmitting antenna would be about 100 m in diameter and the rectenna would be 3 km [11] (Figure 5).

These demos could be steps in a plan that would lead to an economically attractive, globally available, environmentally acceptable space solar power system (Figure 6).

What about the really big space solar power plants? Will we ever get there? I think we will if space solar power turns out to be the best way

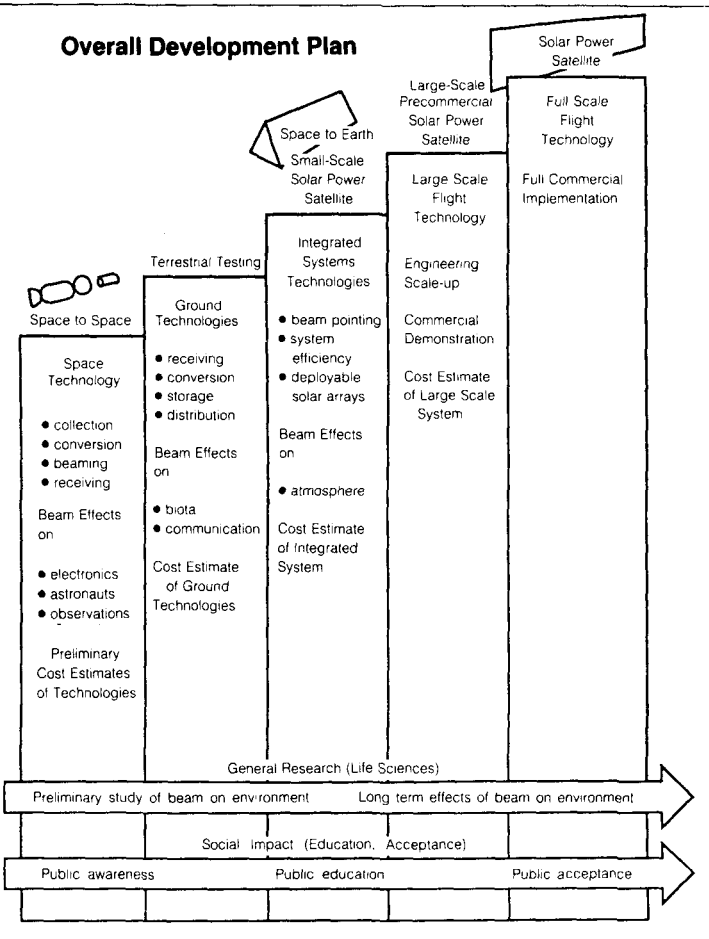

Figure 6: Stepped Development Plan (from ISU SSPP Report).

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to supply Earth. If it is profitable, it will be developed. Did you know that oil companies spend in the range of $3 *billion* each year building offshore drilling rigs? This says to me that the profitability of being in the oil business is huge! This is because the world's transportation energy needs depend completely on oil. The market is large and dependable. Will oil and coal companies see space solar power as a threat? Probably the smart companies will get involved in developing it, since they know that the fossil fuel supply will not last forever. Coal and oil might not last another 100 years.

In conclusion, we do not have to be forever paralyzed waiting for governments to agree to fund multi-billion dollar projects. I am happy to report that experimental work to develop this clean and abundant source of energy for our growing needs has finally begun. Like other big ideas, it pays to start small and work your way . . . up!■

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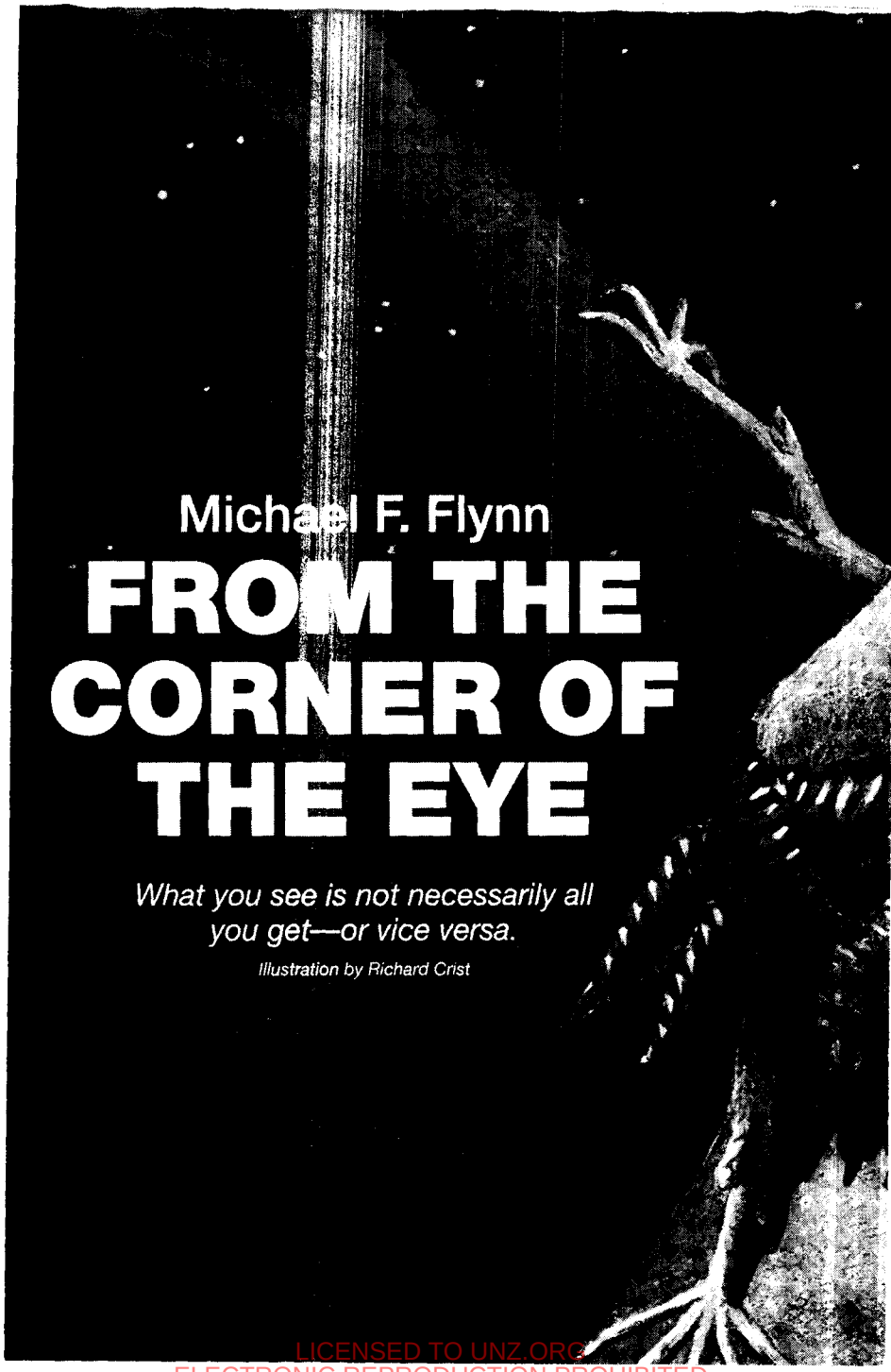

Michael F. Flynn

FROM THE CORNER OF THE EYE

What you see is not necessarily all you get—or vice versa.

Illustration by Richard Crist

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"Evil-ution," said Danny Mulloney to his beer, "is just plain wrong."

The O Neil and I exchange looks. There is a certain way that people have of inflecting their voices, a way of lilting this vowel or that, or stretching the odd syllable or two, that lets you know that they've said more than they've spoken. Danny had turned apostate, you see, and forsaken Holy Mother Church for one of those pseudo-fundamentalist operations dedicated to saving its members from the fate foretold in Matthew 19, 23. Evolution was their *bête noir.* So I knew that Danny had not only meant that evolution was "morally improper," but that it was "incorrect" to boot.

Danny's beer did not answer him, a course of action I was hoping the others at the bar would follow, for a man needs a contemplative frame of mind to enjoy a pint of Guinness—that being what I had before my very self. But Doc Mooney would not let the comment lie there upon the bar and expire, as any decent man would. Instead, he gave Danny an awful stare, one eye squeezed down to a pinpoint and the other opened wide. "Now what d'you mean by that?" said Doc, though he knew as well as I what Danny meant and only intended to engage him in a battle of wits.

The O Neil, that wily rascal, slid off his stool. "Tell me later how it all comes out," he said, then he clapped me on the shoulder and scurried off to the other room, where O Daugherty and Hennessy keep a coin-operated pool table. I sighed and motioned to O Daugherty for another round and resigned myself to fate.

"It doesn't make any sense, now does it?" Danny declared.

O Daugherty Himself, leaning his broad back against the post at the shy turn of the oval bar, flapped his bar rag and hung it to dry. "I wouldn't know," said he, "saving only that those scientific boyos from the University say that it does." There were any number of faculty and students who wandered into the bar now and then, The Irish Pub being so near the University and all. Though Himself never eavesdropped, still he could not help but pick up a little of this and a little of that and a little else beside.

"Ah, now that they do not, Mr. O Daugherty," said Danny, shaking his mug. "That they do not. Why, there are some scientists who say that Darwin was wrong."

"Aahh," Doc Mooney waved a hand in disgust. "It's not the *facts* of evolution they question, only its mechanism. We have learned a thing or two since Darwin's time. Neutral selection, genetic drift, molecular clocks, punc-tu-ated equi-librium." He said that last with a kind of lilt, as if savoring the syllables.

Danny gave a sly smile and let his gaze wander around the bar to check that we were all listening. "Mickey," he said, since he saw I wasn't paying the proper attention, "what is your opinion in all this?"

"Not worth a tinker's dam," said I by way of rebuttal, "biology not being my course of study." Of course, this reminded everyone that it wasn't

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Danny's course of study, either, which he did not want them to think about.

"Look," he said, "according to evilution animals change because there's an advantage to it. Like giraffes grew long necks so they could eat the leaves off the tree tops. So—"

Doc Mooney turned and faced him squarely. "Why, you are a liar, for it says no such a thing as that!"

Danny blinked. "Sure, and it does."

"Faugh! Giraffes did not grow longer necks so they could eat the leaves at the tops of trees. Giraffes eat the leaves at the tops of trees because their necks grew longer. There was no *intention* to it. Chance gave some offspring longer necks and some, shorter; and those with the longer necks found themselves able to browse where no one else could and, that being the case, they—hah!—became fruitful and multiplied." He grinned, no doubt at being able to insert that bit of biblical phrasing.

"Hah, yourself!" says Danny. "Then what became of the ones with the shorter necks?"

Doc Mooney smiled wickedly and took a slow drink of his beer so that we would all wait for his response; but it was a short, round-faced man at the far end of the bar who answered instead. "Why, my dear boy, cattle and deer are still around. The giraffe had one sort of advantage, but that did deprive its cousins of other sorts."

Doc looked a bit put out that someone had stolen his lines. He set his pint down upon the bar. "I don't believe we have the pleasure of your acquaintance," he said. Doc frequently spoke that way. I think he has always been a little miffed at having missed the nineteenth century.

"Oh, sorry." The man blinked rapidly and looked around the bar. "My name is Felix Cooker. I'm a professor at the University."

"And what might it be that you profess there?"

"Biology," he said.

Doc beamed. "Hah! The pro from Dover. Oh, you're a doomed man, now, Danny-boy."

Cooker looked distressed. "I'm afraid I'm not very good at these confrontations."

Danny turned his attention to the professor. "Now, I do not have a fancy college degree like you or the doc, here. All I have is a little common sense." (And did not Doc Mooney grow purple from the strain of biting back his natural reply. . . .) "And evolution makes no sense that I can see."

Cooker nodded solemnly. "What is it that puzzles you?" I could sense that the man was shifting into classroom mode and beckoned to O Daugherty for another refill to pass the time.

"Well, you say that animals improve—"

" 'Become more fit for a certain niche' would be a better way to phrase it. A round peg is no 'improvement' over a square one, unless the hole itself is round."

Danny waved a hand, conceding the point. ". . . Better fit through a series of small changes until finally we have the modern animal in all its glory."

Cooker looked suspicious, but

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nodded.

"Now I can see how that might—and I say *might*, mind you—I can see how that might apply to the giraffe's neck, it being only a matter of growing a little longer or a little shorter; so it is no great thing if the great-grandchildren wind up with longer necks on the average. I can see how a middling-long neck would be an advantage over the short neck, at least in the matter of nibbling at those leaves you spoke of, and the longer neck over the middling one. So at each stage, the advantage grows. But—" And here Danny shook his head sadly. "That is not always so, is it? Why there's a bug. . . ." Danny looked around the bar to be sure he had our attention. ". . . A bug that looks like a turd. Can you believe such a thing?"

Doc Mooney gave him a sweet smile. "Why, now, that's an easy thing to believe." And he was looking straight at Danny when he said it, too; not that Danny noticed. The man had evolved a hide the thickness of a rhinoceros, the which made him more fit for his niche on a bar stool in the Irish Pub arguing with spalpeens the likes of us.

"It looks like a turd," Danny continued, "so the birds that might otherwise eat it fail to notice it at all. Even looking directly at it, the bird is fooled."

"Mimicry," said Doc Mooney. "What of it? It's common enough."

Cooker shuddered. "Oh, yes," he said in a distant fashion. "Very common indeed." And he stared into his drink.

"Well, then, according to evilution," says Danny, "there must have been a time when that poor bugger looked only half like a turd; and earlier still, only 5 percent. Now, tell me, what is the advantage of looking 5 percent like a turd?"

Now, the obvious answer to that was *suppose you tell us;* but Cooker took his manhattan and tossed the whole thing off at a gulp, just like it was nothing at all. "From the corner of the eye," he said.

"What's that?" asked Danny. "What was that?"

"I said," said Cooker in a stronger voice, "from the corner of the eye. Is there no level of lighting, no circumstances at all where a partial resemblance might give a slight edge? Even looking only a little like scat, the insect would fool some of the birds, some of the time. In the twilight, perhaps. If the bird was not quite looking directly at it. It wouldn't always work, of course. It would almost always fail. An edge is no guarantee. But in evolution, an edge is all you need. An insect that resembled a dropping only a little bit would leave more survivors than its sisters who resembled one not at all." Cooked pushed his empty manhattan glass toward O Daugherty. "Over the course of a great many generations, the resemblance would become better and better, because the 10 percenters would outsurvive the 5 percenters. The 20 percenters would outsurvive the 10 percenters. Chance had nudged them in a certain direction; after which positive feedback amplified the advantage."

"So that by today," Doc Mooney

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interrupted in a flourish, "a biologist bird would not even know such creatures existed. They would have dropped right out of its avian perception."

Cooker shuddered again and rapped his empty glass against the bar. "Bartender," he said in a voice gone slightly hoarse, "are you going to fill this glass or not?"

"That I will," said Himself, "if you will satisfy two requirements. The first is that Mickey over there will drive you home tonight. The second is that you will tell us why the subject of mimicry upsets you so."

Cooker's hands jerked. "Does it show?"

O Daugherty shrugged. "It's many years I've been after tending this bar. You develop a knack for spotting those with something inside them wanting to get out."

"You won't believe me."

O Daugherty waved him off. "An Irishman may believe seven impossible things before breakfast." He placed a manhattan on the bar top before him, but did not remove his hand from the stem.

Cooker gave it some thought. "All right," he said softly, and Himself relinquished the drink and backed away. Cooker picked the glass up as if to toss the whole thing off like he had before, but then he put it down untasted. "All right," he said again. "It happened this way."

"You see," said Cooker, "I've always been accounted something of an expert on animal mimicry. It's a subject that has fascinated me for years. There are creatures that resemble sticks of wood, or leaves. Or even droppings, as this young fellow here has pointed out. Other creatures disguise themselves by being the wrong color or giving off the wrong odor. Or the wrong taste. The viceroy butterfly resembles the monarch butterfly, which birds find unpalatable. All sorts of means, you see, to avoid being noticed by predators. So I began to wonder... I began to wonder whether there might be a species that has learned to avoid being noticed by the greatest predator of all. By us."

"By humans?" said Danny in surprise. "Now, what species would that be?"

"Why, we wouldn't know, now, would we," Doc Mooney told him, "never having noticed them."

Cooker nodded. "They would have to be creatures that echoed far back into the dim dawn of humanity. Something we've forgotten we ever hunted. Things of legend or fable. Fairies, brownies, dryads. Leprechauns that could vanish in the twinkling of an eye. Woodland creatures whispered of in a thousand languages. In our legends, the creatures of faerie are often hard to notice. Perhaps there was a reality there once, grunted around Neanderthal camp fires and transformed through millenia of folk tales into quasi-human sprites. Is there some forgotten truth buried there? Some prey that fortunate mutation and natural selection has made so like something else that we no longer see them for what they are?

"The more I considered it, the

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more likely I thought it. I began to look about myself whenever I went out, at trees, at birds, at rocks, at leaves, and yes, even at 'turds.' And I would wonder whether what I saw was the genuine article or only a clever imitation."

Himself had been reaching for a glass to polish, and he paused now with his fingers hovering just above it. Cooker saw, and laughed gently.

"No, bartender. They would not look like glasses. Or bar stools. Or vending machines. Too recent, you see, for evolution to have fashioned it. Folklore speaks of nature spirits. Spirits in trees, in streams, in animals; but never spirits in spear points or basketry.

"Finally, I resolved to settle the matter once and for all. I reasoned that any . . . well, I shall call them faerie creatures for want of a better name. I reasoned that they would have long abandoned regions where their predators abounded. Retreated into fastnesses 'on the other side of the hill.' So I searched out remote areas where old growth forests survived and humans seldom ventured."

"Forests. You had decided on trees, then," said O Daughterty.

Cooker gave him a surprised look. "Why, yes. I thought dryads offered the most promise. Legend speaks of them as living in trees, which would be natural if they resembled limbs or bark. And houses made of wood are often thought to be haunted."

"Knock on wood," said Danny, but his hand froze a fraction of an inch above the bar top as what he had just said sank in. Staring into the varnished wood, he could see his own face staring back.

"A creature that resembled a part of a tree would find its safety in motionlessness, or at best, in moving with the tree. As long as a human was present, by sight, sound or scent, a dryad would remain still and unseeable; but if it thought itself alone, it would move—even dryads must feed—and its motion would betray it. Our peripheral vision, the corner of our eyes, is especially sensitive to motion. So, to prepare myself for my vigils, I studied yoga."

Himself cocked an eyebrow. "Yoga, was it?"

The professor nodded. "Yes. I wanted to learn to sit perfectly still for hours, perhaps for days."

"Yes," said Himself nodding slowly. "In the *savasam* position, and with the right sort of *pranayama* . . . that could work." He stopped suddenly and saw the rest of us looking at him. He reared back. "Well, it *would!*"

"But would that not also drive off your subject?" asked Doc.

"Sure," said I, putting in my penny's worth, "your dryad would never move with you sitting there and watching and all, for then what would be the point of the mimicry?"

Cooker shook his head. "Most animals lack the ability to concentrate. My arrival would undoubtedly cause any dryads nearby to freeze in position, and thus remain imperceptible to me. But, if I myself remained still enough long enough, I would become a part of the landscape, as it were. A dryad would eventually forget that it had seen me arrive and feel

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free to go about its business. Once it moved, my peripheral vision would pick it out."

"Why not use cameras?" said I. "And avoid the problem entirely."

"I could not afford the cameras, film, motion sensors, relays or any of the other paraphernalia I would need for remote viewing. Nor could I carry the equipment from spot to spot around the world. To apply for grant money . . . well, I had my professional reputation to mind. Besides, setting up a video studio in a forest clearing would be at least as disruptive as a quiet, contemplative *yogin.*

"I visited a number of promising sites. In the Bitterroots, in the Sierra Madre, in the Gran Chaco. All to no avail. I studied satellite maps. Finally, I found an isolated mountain valley, nearly inaccessible from below. It was . . . Never mind where it was. In Europe, in the Tyrol. That is all I will say.

"I made my way into the valley—not an easy task for one as desk-bound as I—and hiked until I found a clearing in a high alpine meadow, facing a crystal-blue lake and virgin forest. There I set my stakeout."

He pushed his empty glass toward O Daugherty with his forefinger and Himself filled it again without a word being spoken. Cooker downed half the contents in a single swallow.

"Thank you." He coughed, once, and stared into the pool of liquid in his glass. "Every time I remember, I want to drink and forget."

"Was it so bad, then?" O Daugherty asked.

Cooker shook his head. "Quite the contrary. Quite the contrary." He sighed and resumed his tale. "I set my blind and doused myself with odor-destroying chemicals I had brought. Then I assumed the *savasam* position. I kept my eye fixed just to the side of a likely target, a large beech that might have been as old as the mountain itself. It had a number of boles and knots and branches. Altogether, a promising configuration. Then I chanted my mantra—silently, of course—and waited." He paused and finished his drink.

"And did it work?" asked Doc, breaking the silence. I could see the man was balanced on a knife's edge between skepticism and belief, wanting to accept the story but afraid of being cozened by an elaborate hoax. For myself, I thought it made for a good tale, whether it were true or not.

Cooker looked deep into his now empty glass. He rolled it back and forth between his two palms. "I sat there for two days and a night," he said, speaking now as if we were not present, "unmoving as a stone. Baked by the sun, chilled by the stars. The wind blew leaves and dust in my face. I did not move, I became one with the forest. I breathed slowly, in one nostril and out the other. I fasted, bowels empty, denying the small knot of hunger and thirst that grew in me. Soon, it seemed to me as if I floated above my body in a kind of weightless void. Then, at last, on the second night, just as the full Moon was rising behind me, throwing everything into high relief and shadows of silver, a piece of bark moved." He

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picked up his glass, stared into its emptiness for a moment, then put it down again. No one disturbed the silence that formed to receive his words.

"It was like one of those drawings, those optical illusions, that look at once like an old hag and a beautiful young woman. Twigs became delicate limbs with almost handlike feet. Leaves folded and bent into what seemed an emerald gown. It twisted one way, then another, and I saw that it had two eyes: two, small, black lumps in a blank, elfin face. Despite the roughness of its barky skin, it seemed graceful there in the moonlight, even beautiful.

"So *very* beautiful.

"The sight triggered some ancient predator reflex deep within me. I was filled with an indescribable longing that was half hunger, half lust. I felt my loins stiffen and, before I was even quite aware of it, I was sprinting across the meadow like a panther. Sprinting, at my age! The meadow grasses sawed at my pumping calves. It felt right. It felt good. A small, alpine stream meandered through the grass. I hurdled it in a graceful leap, and hit the farther bank running without a stumble. The dryad, meanwhile, had seen me coming and had frozen again; but its strategy now betrayed it, for I had its position fixed in my mind.

"At the last moment, it tried to scurry up the tree trunk into the safety of the upper branches, but I leaped like a basketball player and snared it between my hands." He looked down at his hands and turned them, first one way, then the other. "Oh, the joy of it! Oh, the triumph! I sank to the ground, crouched with my back to the trunk, and tore the dryad apart with a strength I never knew I had. Oh, I paid for it all the next day, with sore muscles and stiffened thighs and strained joints. Hysterical strength, it's called. Something our bodies carry in reserve and, under stress, release in a great spasm. Now I know why we have that vestigial ability. Now I know why. The creature's bark-like shell cracked in my grip, exposing its innards, and I shoved it to my face and began to feed.

"It was the most delicious meat I have ever tasted. It was ambrosia, the food we were meant to eat. The food of the gods. The pleasure was visceral, even sexual. The greater part of my brain had ceased to exist. The entire cortex had vanished and I was once more the hunting animal we once were. As I fed my cells, my stomach, my loins cried out for more. *I did not come back to myself until* hours later when I found myself howling at the risen Moon with the broken carapaces in either hand licked wholly clean."

Silence filled the bar room as he finished speaking. Cooker's narrative had stirred something within us, for on the face of every man there I could see the same combination of revulsion and desire. Cooker's eyes were haunted. "I have never felt so good in all my life," he whispered, "and I pray to God I never feel so good again."

"Ah, no," said Doc, "it would be

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no sort of life, at all. Still," he added wistfully, "one cannot help wonder, just a little, how *it* tasted."

Cooker hunched over the bar top, his knuckles white on the empty manhattan glass. "You don't want to know. You'd spend the rest of your life aching for another taste. Just another taste.... It was only the cold that finally drove me down from that valley. Only the cold."

For myself, I wondered, too. About legends of men who thought they became wolves when the light of the full Moon threw things in sharp relief and nocturnal creatures incautiously moved. But I kept these thoughts to myself.

"That is not what worries me," said Himself. The glass he was cleaning squeaked in his hands as he rubbed it with a damp rag. "That is not what worries me, at all." He looked at each of us, and he looked into each shadowed corner of the room. "Predators practice mimicry, too, do they not?"

The O Neil sauntered out of the pool room at that point and clapped me on the back. "I'm hungry," he said. "Let's go out and grab a bite." ■

Imagine what you yourself have wanted to say about ideas and events. Imagine the insightful comments that are even now fading from the memories of both speakers and listeners all over the world. On a hypertext system, comments will be easy to publish and easy to find. Imagine the *questions* that have bothered you. You could publish them, too; someone finding an answer could then publish a reply.

K. Eric Drexler

Once a bad idea reaches print, it takes on a life of its own, and even its author can seldom drive a stake through its heart.

K. Eric Drexler

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Jeffery D. Kooistra

SPCPT. VU

The most important part of an education may have nothing to do with school. . . .

Illustration by Janet Aulisio

Three-year-old Treva Marie Coystre toddled out the door of the cottage and down the porch steps when her parents, Frank and Trudy, weren't looking. She'd never been at this cottage before; her parents had purchased it only a week earlier, and this was her first trip here.

She didn't quite know what to make of the backyard. It was awfully green back there, with bushes and wildflowers and trees galore, and in the distance the green peaks of Ozark mountains wandered off and faded into the sky.

Treva Marie wandered over to the daisies and black-eyed Susans that grew in profusion. She liked it here! She walked slowly through the flowers, reaching up to bring the blossoms down for inspection.

Ambling along to a big oak tree, she dropped onto her bottom while she let the gentle breeze bring the wild and pretty scents to her.

KABOOM! She looked up just in

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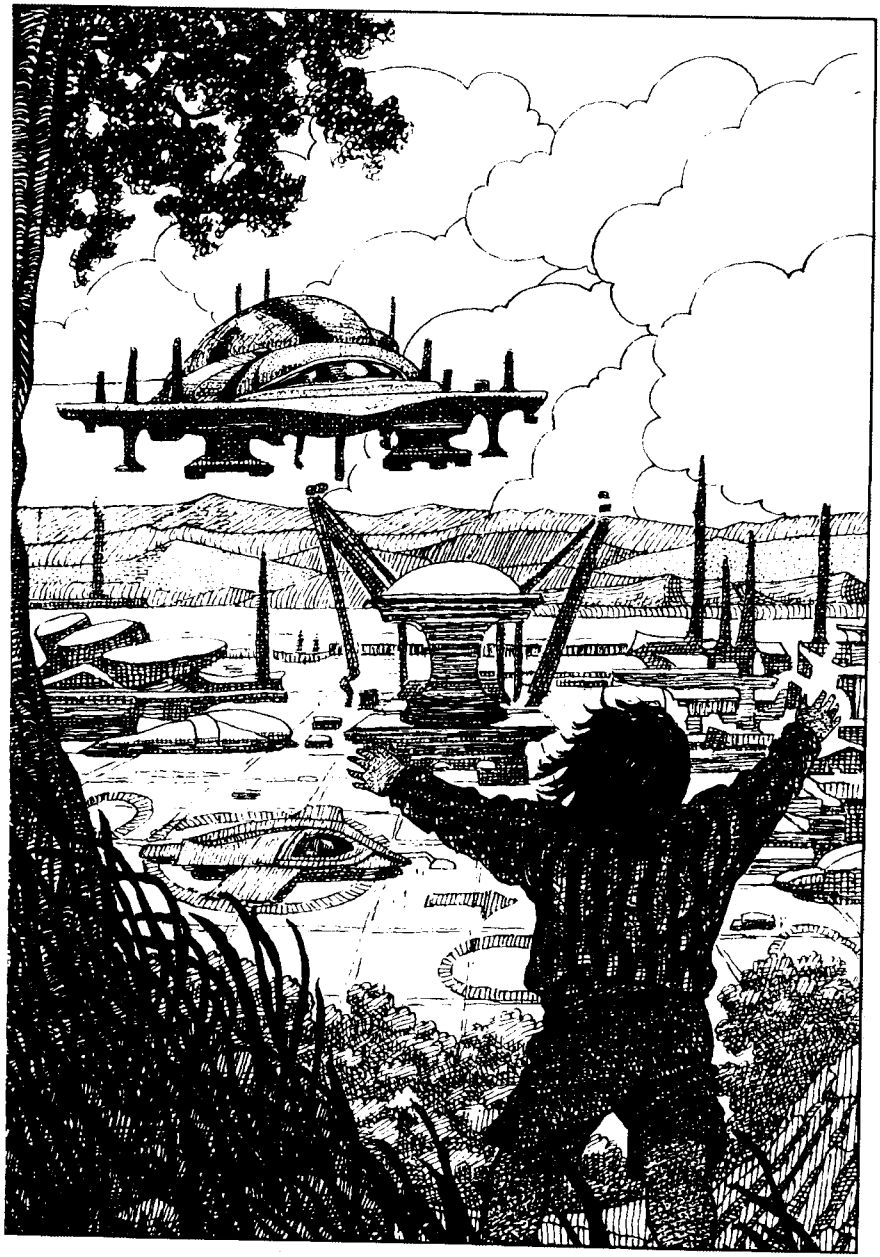

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time to see some kind of "airpane" zoom past overhead, and she followed it with her eyes as it disappeared below the edge of the ridge. She got up and headed toward that ridge herself; she wanted to see that plane some more.

"Treva Marie-eeee!" It was daddy's voice. What did he want now? She kept going; she had business of her own to take care of.

"She was just with us a few minutes ago. How did she get out of the cottage?" Treva Marie barely heard her mother's voice. She continued to the edge of the ridge and stopped. She was at a cliff, and it was a long way down, much farther than she cared to fall. There were trees down there, and a stream, and birds flying by *below* her. Now that was a new experience. She followed the flight of a pair of robins until she caught sight of the spaceport. What was this?

She sat down on the edge of the cliff, between two more oaks, and stared fixedly at the spaceport. There was the airplane she'd seen earlier, way far away, but getting closer and closer to the ground. "Going home," she remarked out loud.

"Frank! She's over by the cliff!"

"I see her. I'll go get her."

"Don't startle her! I don't want her to fall!"

Frank made plenty of noise as he approached his only child. He saw her turn as he approached, looking him over with those big eyes of hers, but then she turned away again.

Her daddy came up to her, grabbed her under the arms, and lofted Treva Marie up in the air. "All right, young lady. Time to get back now." Treva Marie laughed with delight. He hugged her tightly.

She pointed. "What's that, Daddy?"

Frank followed her little fingers to see the spaceport. The tarmac started about a half mile from the bottom of the hill the cottage sat on, and covered thirty square kilometers of Missouri with runways, landing pads, dock facilities, and luxury hotels for the rich spacefarers. On one of the nearer pads a luxury liner was prepared for flight, only moments away from lifting into the heavens, from rising majestically to the stars. "That place is called a spaceport, honey. People leave from there to go to the Moon and the planets and the stars in spaceships like that one over there."

"Can I go to the Moon?" Treva Marie asked.

"Maybe someday, sweetheart."

They watched a while longer, and Trudy came to join them. She was afraid of heights, and kept back from the edge. "Frank, I wish you'd come away from there with our baby."

"All right, Trude." But as he took a step and moved to what his wife considered a safe distance, he and his daughter continued to look at the spaceport.

And then the big luxury liner did start to lift, effortlessly and silently and beautifully, until she disappeared into a cloud.

"Wow!" Treva Marie said.

"All gone," Frank said.

"Bye, bye," said Treva Marie, as her mom and dad escorted her back to the cottage.

* * *

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Four years of time had brought changes to that backyard. There were still wildflowers, but now they'd been exiled to the edges of the lawn. Other flowers, in carefully manicured gardens, formed islands of color in the pond of green grass. Marigolds, petunias, and begonias held court under the roof of the oaks.

A new swing set sat off in a corner of the yard; but the patch of dirt from sliding feet was under the tire swing that Frank had hung from the branch of the very oak tree that Treva Marie had sat beside during her very first foray into that wilderness.

The swing swayed slowly back and forth, still slowing down from the workout Treva Marie had given it minutes before. The girl herself was in her favorite spot again, between the two oaks by the cliff, looking out at the spaceport, watching the shuttles zip in from the surrounding country. She still remembered the first time she'd seen one, and it was in fact her earliest memory. On the far side of the spaceport she saw a lunar transport lift and accelerate rapidly on its way to Luna City. Closer by, two luxury starliners stood on their tails awaiting their next voyages into the heavens. They'd visit places like Jupiter and Saturn, and then go to the stars, to exotic planets with names like Wilderness, Tropic, Spring Thaw, and Jungle, circling stars with pretty names like Eta Cassiopeiae, Tau Ceti, Beta Hydri, and Alpha Centauri.

Though still very young, such names beckoned Treva Marie. She didn't understand why, but those magic names instilled within her longing. Her youthful imagination formed wonderful pictures of those places, and though wildly inaccurate, the lure of adventure was very real.

She felt a soft bump in her back. It was her kitty cat, Cassie (short for Cassiopeia, of course, Treva Marie would always say), rubbing her head against her, progressing down her arm and waiting expectantly to be petted. Treva Marie picked up her cat and rested her in her lap, gently stroking the soft fur of the tabby, while she dreamed of distant places.

Cassie purred softly and gave every indication of making a day of it right there, when a rustle in the bushes

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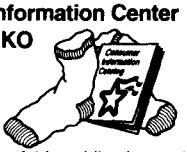

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came from below. Cassie looked up and caught sight of a rabbit. Instantly she leaped out of Treva Marie's arms and made a two jump descent down the cliff, which, though it had looked incredibly high to a three-year-old, was only about ten feet or so.

"Get back here, Cassie!" Treva Marie ordered. "Bad kitty! Bad kitty!" Despite the shouting, Cassie pursued her quarry into the brush. Much more carefully than her cat, Treva Marie went down the cliff herself to find Cassie.

She'd been down here before, had been to the creek many times, which lay at the bottom of a long but gentle slope from where she stood at the base of the cliff. Ordinarily, Treva Marie would have told her parents where she was going, but this was an emergency; Cassie wasn't supposed to be down here. She didn't know it, but her cat knew the surrounding countryside infinitely better than she did, having made good use of the cat door on many occasions while Treva Marie was asleep.

She followed the path down to the creek. "Cassiiieeee! Cassiiieeee! Come back here you dumb cat!" She heard a noise to her right. The rabbit bounded through a little clearing, followed by a gray blur. "Cassie! You leave that bunny rabbit alone!" The rabbit and the cat ran out onto the path and raced away, and Treva Marie set off in hot pursuit.

She followed her cat down to the creek and then along the bank. The path didn't go this way, but the grass wasn't too thick and it was easy to travel through. Into a grove of trees she'd run, then out into a glen, and finally, after any number of twists and turns and backtrackings, she stood in a patch of wildflowers in a clearing with unfamiliar trees all around. She was utterly lost.

"You stupid cat! Now I'm lost because of you!" As the words emerged she felt a familiar bump against her legs. She picked up Cassie and scolded her severely, but Cassie purred and licked her fingers and Treva Marie forgave her.

"Well, kitty, we have to go home now." Treva Marie looked around her, but the tree cover was too heavy to see beyond. She and Cassie set out through the woods to find a bigger clearing, one from which she could see the ridge with her cliff, and cottage, on it. But the woods just seemed to keep getting thicker. "I don't know if this is the right way, Cassie. I can't see anything from here. I wish I could find the creek; we could follow it back." Cassie didn't seem too concerned as she rode comfortably in Treva Marie's arms.

Treva Marie saw something up ahead, and as she got closer, she realized it was a fence. "Look, Cassie. This must be the spaceport fence." She paused for a minute to think. Since this was the spaceport fence, she knew the cottage was the other way. But she didn't just want to turn around and wander back into the woods. She might get lost again. But if she followed the fence to the left, she'd certainly run into the creek, and then she could follow that back home. "I think I can get us home now, Cassie," she said. Receiving an ac-

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knowledging purr from her cat, Treva Marie followed the fence.

Presently, after circumnavigating some bushes and trees in her way, Treva Marie arrived at the place where the creek ran under the fence and into the spaceport grounds. She discovered immediately that the fence didn't actually go into the water, but rather was suspended over the creek with cables. Down near the water was a small path that also went under the fence and that she, with a little ducking, could follow.

She knew she shouldn't; mom and dad wouldn't like it. But they'd never actually forbidden her from visiting the spaceport, had they? No, but she wasn't even supposed to be this far away from home. But she hadn't wanted to be! She just had to get her kitty.

Treva Marie hesitated. Cassie struggled a bit in her arms, and she let the cat down. Then Cassie made up Treva Marie's mind by instantly following the path under the fence. "Well, now I *have* to go," she said to herself. But she wasn't at all mad at Cassie this time.

Once under the fence, only a little bit of walking, complicated by Cassie trying to rub up against her legs the whole way, brought Treva Marie to the lawn that surrounded the tarmac of the spaceport. The two starliners towered above her, so graceful and so beautiful. The stars had never felt closer.

Cassie was poking along the edge of the tarmac when a cricket hopped out onto the tarmac, and Cassie pursued it briefly. But with a second leap and a gentle buzz of wings the grasshopper returned to the weeds and Cassie lost interest and continued her investigations along the edge.

Treva Marie went to her kitty, and Cassie offered no resistance to being held once again in her arms. The girl stood there; behind was the woods and the path home. But before her was another path, and though her young mind had no words, the call resounded through her soul, that the path before her was the one she would, no, *must*, take.

She lifted her foot to take the step when a call came through the trees behind her. "Treva Mariiiieeee. Can you hear me?" It was her father.

Reluctantly, she turned from her destiny and said, "I'm here, Daddy. I went under the fence by the creek."

"OK, honey. Just stay where you are until I get there." Soon her father emerged from the trees and came to her. "What are you doing here this far from the cottage?" he asked. With relief Treva Marie heard only concern, but none of the anger she expected.

"Cassie ran away after a rabbit down the cliff, and I had to come get her or she would have been lost," Treva Marie said.

"I think Cassie probably already knows her way around pretty well, honey. She knows how to get back," Frank said.

"Oh."

"C'mon now. We have to go. Your mother's already worried enough."

"Is she mad?"

"She would be if I told her you went this far away. If you promise not

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to do it again without permission, I'll keep it our secret."

"I promise, Daddy," Treva Marie said solemnly.

Her father took her by the hand, and Cassie was left to walk home. Treva Marie turned back one last time to look at the starliners, and now that the Sun had just set, she glimpsed the twinkling spectacle of Venus.

"Look, Daddy! The first star tonight."

"Make a wish," her father said.

She paused for a moment, then said, "OK."

"What did you wish for?"

"It won't come true if I tell," Treva Marie said. So she didn't tell her father, then, that she had wished that one day she would follow the other path, the one that didn't lead back to the cottage.

But her father already knew, having made similar wishes—many, many times—himself.

"OK, Ricky. But let's ride down the creek path to the spaceport," Treva Marie hollered up ahead to her friend.

They were out riding their bikes that morning, a delightful activity they had engaged in often together, only this time it wasn't such a happy thing.

Ricky stopped pedaling and coasted while he waited for Treva Marie to catch up. When she pulled alongside him, he made a display of looking at his watch and said, "Only five hours and forty-three minutes until I leave forever, Treevz."

"I know. Don't keep reminding me."

They were trying to enjoy this last dying day of the summer, thoroughly, utterly, totally enjoy it as only two eleven-year-olds can, and for much of the summer they'd succeeded. Ricky's parents lived in a house just a mile up the road from the Coystre's cottage, and since she was nine, Treva Marie had spent her summers with Ricky. They'd gone hiking in the high hills, scooped up crayfish from under the rocks in the creek, and ridden their bikes far and wide along the winding mountain trails.

But now the good times were coming to an end, for Ricky's father had been transferred out system, and Ricky's family would be leaving for Tau Ceti in less than six hours. Treva Marie had a going away surprise for him, but she was waiting for the right moment to give it to him.

A tabby blur flew past the pair. "Hey, it's Cassie! She must have followed us," Ricky exclaimed.

"You know how she likes to chase rabbits," Treva Marie said, catching a glimpse of bounding ears hopelessly outdistancing her cat.

They rode slowly along the edge of the creek. Treva Marie found herself looking at her friend, noticing his tousled brown hair and his tanned arms, almost as if for the first time. She tried not to think about this being the last few hours she'd ever spend with him, but she couldn't help it.

"I'll miss you, creek," Ricky said, pronouncing the word as "crick." He steered his bike off the path and dropped it to the grass near a bend where the stream formed a large, deep pool. Treva Marie dropped her

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bike, too, and they looked around for flat skipping stones. Ricky found one first and set it off, three big skips and a dozen baby ones.

After that, they rode on again until they reached the fence of the spaceport. They leaned their bikes against the fence and followed the trail underneath until they were standing on the edge of the tarmac.

"See that big one over there," Ricky said, pointing. "That's the one, the *Fairy Princess.* They should be loading the freight about now."

"You mean the luggage?"

"No, dummy! The real freight, mostly Earth spices and paintings, and a lot of electrical stuff, stuff the colonies can't get by themselves. The luggage keeps getting loaded almost until lift-off. That's what my dad says."

Treva Marie picked up Cassie, who had been weaving in between her legs, and cradled her baby fashion. "I wish you didn't have to go," she said.

"But I want to, Treevz. You know I've always wanted to go into space. Maybe someday I'll even be an astrogator. Isn't that what you want, too?"

"Since as long as I can remember. But aren't you going to miss me?" she asked meekly.

"Yes, Treva. I wish you could come along." He gently took Cassie away from her and scritched the cat behind her ears. Cassie had always liked Ricky. In fact, Treva Marie had first met Ricky when she followed Cassie one day to see where her kitty kept disappearing to every morning.

"Promise you'll remember me, Ricky."

"I promise."

He stood there, looking out over the field at the *Fairy Princess,* and Treva Marie decided now was the time to just do it.

The kiss took him by surprise. "What are you doing?" He dropped Cassie and stepped back.

"I'm trying to kiss you good-bye, stupid!" she said, starting to cry.

Ricky looked confused, then sputtered, "Well, don't just spring it on me with no warning like that. Sheesh!"

"Oh, just forget it!" She turned to stomp away. He caught her arm and stopped her.

"No. I . . . I want you to kiss me good-bye."

"You do?"

"Yes."

"Mom! Mom! Ricky kissed me!" she called when she came in the house.

"He did? When?"

"Half an hour ago. He kissed me good-bye. Well, I guess I really kissed him. But it was a kiss. My first real kiss! And it was *so* romantic. We were down by the spaceport—"

"What were you doing down there? I told you to stay away from the spaceport—it's dangerous." Oops. In her excitement, Treva Marie had let slip where she'd been. Mom had forbidden her to go under the fence way back when she was seven, though dad knew she still went there.

"But Mom . . . Ricky wanted to see it. And it's the last time he'll ever get to. I *had* to go." She had her fingers crossed behind her back.

"Well, OK, I guess I understand.

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But no more, all right, honey? I couldn't stand it if anything happened to you."

"I won't, Mom," Treva Marie said, fingers still crossed. She had at least one more trip to make to the spaceport.

An hour before the *Fairy Princess* was set to depart, she put Cassie in her bike basket and set out again for the spaceport. But this time she followed the road and thirty minutes later she rolled up to the passenger terminal. Locking her bike, she carried Cassie inside and then out onto the observation deck. From there she hoped to see Ricky and his family ride out to the ship on the passenger tram.

The field buzzed with activity. Luggage autoloaders raced around the field, delivering the passengers' belongings to the right ships, and lifting the crates and suitcases into the cargo holds. Last in means first out, her dad had told her. Men on the ground scurried about like ants in a broken anthill.

She spotted the tram. Scanning the faces of the passengers riding out in the open, she recognized Ricky just as his face lit in a smile as he recognized her. She waved. "Bye, Ricky. Have a good trip. I'll miss you," she called, but he was too far away and it was too noisy for him to hear.

It happened in an instant.

Cassie saw Ricky, too, and twisted out of Treva Marie's grip, and then she was through the guardrail and down on the ground, chasing after the tram.

"Cassie! Come back here! Somebody stop my cat!" Treva Marie screamed.

Cassie gave up on the tram, sat down where she was and started to wash herself.

"I'll get her," a luggage handler yelled up.

Cassie saw the man running toward her and she raced away in the direction of the *Fairy Princess*. The man kept pursuing, Cassie outdistancing him easily, and then in two bounds she was atop the autoloader.

Whoosh! The autoloader hefted the luggage, Cassie with it, and tucked it inside the spaceship. The last load, the cargo door slid shut.

"No!" Treva Marie sobbed. She had to tell someone. She had to have Cassie back!

But there was no one who could help her.

During the confusion caused by Cassie, she'd missed seeing Ricky board the ship. The passenger tube was already pulled back, and all the vehicles that had been servicing the *Fairy Princess* had returned to their places. Then the mighty craft, utilizing energies Treva Marie understood not even dimly, lifted silently and serenely from the field, carrying her cat and her best friend to the stars.

The *Fairy Princess* would take a year to get to Tau Ceti, and from there would head out even farther before returning to Earth, and incomprehensible to Treva Marie, three years later.

She rode her bike home, crying all the way. Her mom didn't even get mad at her for going to the spaceport.

A week later, the telefax had a let-

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ter for her:

Dear Treevz,

I saw what happened with Cassie, and dad told the captain right after lift-off. Capt. Chang ordered a search of the cargo compartments and they found Cassie right away. She's with me now. I'll take good care of her, Treevz. I promise. Tomorrow we go into hyperdrive. All right!

Your friend,
Ricky.

"No, you can't go, and that's final! You're too young," mom said for the third time.

"But Mom, I'm *fifteen!* I'm not a little kid anymore! I graduated two years early from school and my test scores are almost perfect and this is what I've always wanted to do. Please, Momma, I want to *go.*" The argument had begun, yet again, with the arrival in the mail of the application to Space Academy. Treva Marie had voiced her interest in going only last year, though she'd thought about it since the first time she'd heard of the place. First her mother had laughed at the idea. Three months ago Treva Marie had taken the qualifying exam, but only with mom's grudging permission.

When the scores arrived, and Treva Marie's scores were in the 98th percentile so it was certain she'd be accepted, the fireworks started. And today the application started them anew.

"Treva, I've told you again and again—you can't go. You may think you're a grown up young lady, but you're not. Your Uncle Bill thought he was—"

"Oh, don't start with Uncle Bill again," Treva Marie said, cutting mom off. "The crash was an accident. He could have died the same way on Earth—"

"What's going on here?" It was dad, just returned from town with the groceries.

"Dad, the Academy accepted me and Mom won't let me go!"

"You're too young! Frank, you tell her."

"I am *not!*"

"Treva Marie Coystre—go to your room!" mom ordered.

"I won't! I'm going outside." She stomped out the door.

How could mom be so mean?

Treva Marie contemplated the question as she sat down at her favorite ledge and stared out toward the spaceport. She saw that the *Fairy Princess* was already in departure position, though only recently returned from a brief one year out and back trip to Alpha Centauri.

The day's mail had brought more than just the Academy application, and she took the letter from Ricky out of her pocket. A light wind lifted the scent of wildflowers and carried it past her as she moved her bangs out of her eyes. The aroma brought back a dim memory of giant flowers and high cliffs, now pushed aside as she sought the last paragraphs of the letter to reread:

Cassie is doing just fine, Treevz. The official story is that the second mission to Tropic brought along the rats, which multiplied all over the place. Cassie has become something

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of a kitty cat hero because she kills at least three rats a week. She also likes to roll around in the mossy grass, and the native trees have this soft bark—it feels kind of like baseball glove leather—that make them really easy for a cat to climb.

But Treevz, I think she still misses you. It's weird, but some nights she climbs her favorite tree in the backyard and lays on a branch for hours and I swear she's looking at the sky, almost like she knows you're out there. . . .

She knew it was silly, but Treva Marie wiped away the tears and believed Cassie still loved her.

She watched a shuttle land at the spaceport, then kept looking that way as the daily Moon ferry rose smoothly and swiftly into the sky.

"You have to let me go, Mom. You *have* to," she whispered to herself, and then defiantly repeated the old battle cry of others who had felt as she did now, trying to hold their dreams together while outside forces sought to unravel them. "I'll go even if I have to walk!"

It made her feel a little better, though not much. So what if Uncle Bill had died in a spaceship crash? That was years ago, before she was even born, before mom and dad had even met. Besides, at least Uncle Bill had gone to space like he'd wanted to. He probably died happy—that's what dad used to tell her.

But of course, not when mom was around.

"Treva?"

Dad's voice startled her; she hadn't heard him approach. She turned and stared up at her father, witnessing again the soft eyes that mocked his steel jaw. "Yes, Dad?"

He sat down next to her, dangling his feet over the edge like she had. "I knew you'd come out here," he said. "You always seem to find some excuse to come out here, ever since the first time we came up to the cottage. That spaceport always attracted you. And your Mom's always been afraid you'd fall over the edge."

"Why, Dad? Is it really Uncle Bill? Is he the real reason she doesn't want to listen to me when I bring up space?"

"Treva, you've got to understand. Uncle Bill was your Mom's twin. You're an only child, so you can't begin to imagine what it's like to grow up with a brother, let alone a twin brother. Your Mom was always skittish about spaceships. I can't even get her in an airplane. So when Bill went to space, she was already nervous about it. When he died, well, it sewed up her fears so that now she can't be rational about it at all."

"But why do I have to suffer?" Treva Marie said, starting to cry. "I have to go. It *burns* inside me, Dad. It always has. You know it does, don't you? Can't you talk to Mom? Can't you make her understand?" She put her head down on his lap.

He took the application form out of his pocket. "Here, sweetheart. You should fill this out as soon as you can."

She sat bolt upright. "What? You mean . . . ?"

"You're going, Treva. I convinced your Mother that it was for the best."

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She took the application and joyfully danced from tree to tree. "Oh Daddy, Daddy! I can't believe it! I'm going to go to space. I'm going to be an astrogator." She ran to him and gave him a hug. "How did you ever talk Mom into it?"

Frank smiled, and looked out toward the spaceport. A troop transport from an admiral class battleship was sliding down to a landing, bringing the men in for shore leave. "I explained to her that you have too much of your father in you," he said.

She watched the spaceport from her window as the aircraft turned and reoriented itself for the landing. Treva Marie hadn't been at the family's summer retreat in four years, and this return was prompted by the unhappiest of occasions.

The message from her father had been short and simple: *Soon Treva. Very soon. Please hurry.* She knew what it meant. Though her first deep space training mission was only a week away, she caught the first flight out of Seattle.

The brain tumor had been discovered the year before, but only after her mother had complained for months of headaches and disorientation. Surgery and therapy had prolonged her life, but that brand of technical luck was running out.

Mom was dying. There wasn't anything anyone could do about it.

The plane landed, she debarked, and then stared in the direction of the hills, through the notch to where the cottage sat. Later, the aircab brought her through that notch and left her in the backyard.

Upon entering, Treva Marie noticed that, unlike last Christmas, there was no medicine smell in the cottage. She entered the bedroom. Mom lay there, small and worn, apparently asleep. A lone IV injector sat on the bedside table. Treva Marie looked at the IV bag. Neomorphine 4, the standard painkiller for the last stages.

"Treva, you're here," her mother said.

"Mom! You're awake." Treva Marie bent down to give her mother a loving, but careful, hug. Then: "Where's Dad?"

"He had to run to town for food. He didn't want to, but I insisted. He hasn't been eating properly."

Though her mom looked, frankly, like hell, she was alert and wanted to talk. "So, my little girl is getting ready for her first big trip, I hear," she said.

"I'm supposed to leave next week, Mom. Jupiter, Uranus, the stations in the Kuiper Belt, and then back home. I'll be gone for six months."

Treva Marie didn't mention that her leaving was contingent upon her mother's dying before the departure date. But mom said, "I won't be keeping you from the trip, Treva Marie. I tried to keep you from space often enough. I won't do it now by hanging around too long."

"Oh, Mom, don't say that!" Treva Marie burst out crying, crouched by the bed and put her head on her mother's shoulder.

"It's all right, honey," mom said, gently stroking her hair. "I never took the time to let you explain to me why going to the stars is so important to

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you. Tell me now."

And Treva Marie did. She told her about the longing, about the hollow spot inside that somehow filled up when she looked at the starry sky. She told her about the feeling of destiny that resonated in her soul whenever she'd looked at the spaceport from the cliff. She told her about turtles drawn to water, and birds drawn to the air, and mountains crying out for climbing.

And her mother said: "Your Father put it much the same way, a long time ago."

"He did, Mom?"

"I made your Dad give up the stars when he married me. He felt all the same things you do, I'm sure. I think he only bought this particular cottage because of the view of the spaceport. He probably hoped it would draw you the way it did him.

"Did he ever tell you what it is he said to me to make me let you attend the Academy?"

"He just said he explained to you that I had too much of him in me," Treva Marie answered.

Mom laughed. It was thin and weak, but Treva Marie cherished it. "That's just like him. Actually, he threatened to leave me."

"He *what?*"

"He said he'd demand a divorce if I didn't give in. He told me that one person in the family sacrificing his dreams for my brother was enough.

"I knew he was lying. We both knew he was lying; he never would have left me. But when I saw the love in his face, and the anguish he felt on your behalf . . . well, I just couldn't do it."

"Oh Momma." She hugged her again, hard this time.

"Promise me you'll be happy, Treva Marie. Promise me," she whispered.

Mom hung on for another day, but she was asleep most of the time. Just before she left she woke one last time and said good-bye to Frank, but it had been Treva Marie's turn to go for groceries, and when she got back mom had already left.

Two days later Treva Marie stood with her father and an urn full of ashes by the little cliff.

"This is what she wanted, Treva," dad said. "We talked about it when it became clear she wasn't going to get better." They each held the urn, and Treva Marie opened it. Then with a gentle swing they released the ashes. The breeze blowing up the valley caught the ashes and lifted them high, and they were spread to the four winds.

"Well, that's that," dad said after a while, silent tears trickling down his face.

Treva Marie held her father tightly. "It's just us now, Dad," she said.

"When does your flight leave?" dad asked.

"Tomorrow. But I don't know if I should go anymore. Not right now, anyway."

"Don't be ridiculous," dad said. "I'll be OK. I want you to go and fulfill your dreams. It's what your Mom wants, too."

" 'Wanted,' " Treva Marie corrected.

"Wants." Firmly.

"OK, Dad. What are you going to

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do now?"

"Go back to work, for starters." He pointed toward the spaceport, at the gleaming starliner just lifting. "Seeing that reminds me of something. Have you heard from Ricky lately?"

"It's just 'Rick' now, dad. I got a letter a couple of months ago," Treva Marie said.

"How's Cassie?"

"She's with Mom."

"Cassie! Get away from that ledge!" Treva Marie ordered, looking up from her writing pad. The kitty's full name was Cassiopeia Threeopeia, grandkitten of the original. Rick had given her to Treva Marie on her last stop in the Tau Ceti system. Now the cat revealed the same fascination her ancestor had at the valley down below the cliff.

Cassie, not quite ready to brave the valley on her own, relented at Treva Marie's command and walked over to the base of an oak, flopped onto her side, and licked her paws.

Treva Marie returned to the task at hand, writing a for sale ad. Dad had asked her to write one, as he was too busy to take care of the details himself, and it was best if the cottage were sold before both of them were off planet.

So far she had written: *For sale, mountain cottage, 3 bedrooms, 2 baths.* Later she'd collapse the text into the abbreviated style for home sale notices, but for now she was content just to put down all she felt needed to be said.

That was no easy task.

How could she say all that needed to be said, when so much of her life had been determined by this little cottage in the mountains? It was here that her mother had died four years before, and this very ledge from where mom's ashes were scattered to the winds. It was at the cottage during the summer that she'd received her first kiss, suffered her first loss, and known *longing.*

The memories flooded her.

She looked out at the spaceport, and caught the glint of sunlight off the bulbous nose of her father's ship, the freighter *Lake Superior.* Dad had joined the merchant marine last year, had finished recently at Merchant Marine Academy, and had already been on several intrasystem trips. The *Lake Superior* was due to lift in a few minutes, this time for a loop around Jupiter, Saturn, and Ceres on the way back. And after a few months back on Earth, she'd fling herself to the stars.

Treva Marie had watched hundreds of ships depart from this particular vantage point. Soon she'd watch one carry her father to his dreams.

She got back to the ad. . . . *big backyard,* she wrote, then, looking over at Cassie, chin on paws, dozing underneath the old oak tree, she added, . . . *heavily wooded.*

A warm wind wafted up through the valley, carrying the myriad of scents of the wildflowers, and the faint sound of the splashing and chuckling of the stream below.

For a few moments, the bittersweetness of writing an ad to sell the cottage overcame her, and she shed soft tears that the breeze dried off her cheeks. The cottage had been her home only for the summers, but it had been so much more important to

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her than the house in the city. Houses really—they'd moved three times.

But now it was time to leave—time to leave for good. The cottage had been her cradle, but *one cannot remain in the cradle forever.* It was time for some other family to spend its summers at the cottage. And maybe some other little girl. . . .

There it went! Up, up, up, the *Lake Superior* carved its groove into the sky, slicing smoothly and effortlessly through the deep blue, cleaving *nebulae* of cotton on the way. "Bye, Daddy. Have a nice trip. Godspeed."

Cassie roused herself from her respite, wandered over and rubbed her head against Treva Marie's back. Treva Marie added the finishing touch to her ad: . . . *Spaceport view. Great for children.* ■

LESTER DEL REY
1915-1993

Lester del Rey, noted science fiction and fantasy author, critic, and editor for many decades, died May 10 at the age of 77 after a brief illness in a New York City hospital. Born Ramón Felipe San Juan Mario Silvio Enrico Smith Heathcourt-Brace Sierra y Alvarez del Rey y de los Uerdes, del Rey wrote his first published story, "The Faithful," on a dare from a girlfriend—and sold it to this magazine, then called *Astounding,* in 1938. He became a regular contributor both here and elsewhere, sometimes under pseudonyms, producing numerous stories still regarded as classics, including "Helen O'Loy," "The Day Is Done," and *Nerves.*

Though he was a prolific and highly regarded writer of both short stories and novels, Lester is now perhaps best known for his work as an editor. Over the years he edited several magazines, and is remembered by many writers as a tough, demanding, and invaluable influence on their careers. While Managing Editor and Features Editor of *Galaxy* and *If,* he met his third wife, Judy-Lynn (Benjamin) del Rey. Together they had an enormous influence on science fiction and fantasy book publishing through Del Rey Books, which started out as a Ballantine imprint. Judy-Lynn died in 1986; Lester retired in 1991 (*with the intention of returning to full-time writing*); but Del Rey Books remains a major force in the field.

Lester was a book reviewer for *Analog* from 1974 to 1979, and we were truly sorry to see him go. In 1990 the Science Fiction Writers of America awarded him a Grand Master Nebula in recognition of a long and many-faceted career that will not soon be forgotten.

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THE ALTERNATE VIEW G. Harry Stine

POLLUTING, PART 2

Stine's Law of Letters: The quantity of blood that gushes from sacred cows is a function of how badly the ox is gored. Corollary One: The number of reader letters depends upon the use in this column of semantically-loaded terms, be the loading the result of the real world or an expression of human ideology. Corollary Two: The pH of the literary content is a function of how broadly the writer thinks.

"Polluting the Universe" confirmed this for me. I usually don't hear from those who agree with me, only those whose chain I yank. As usual, I was astounded that the letter writers (a) didn't know how to read, (b) didn't read what I wrote, (c) attributed to me something I didn't write but they thought I did, (d) didn't understand simple concepts such as magnitude of numbers, (e) failed to cite data or findings to support their positions, much less quoting any numbers whatsoever, or (f) are riding on someone else's band wagon with no knowledge of what's pulling it or the direction it's going. That's normal.

In an attempt to bring some rationality into the present Green approach to pollution, let us return to Square One. The first step in doing this is to define the terms used.

For purposes of this discussion, the word "system" refers to any activity that utilizes energy or matter available in a larger system that is referred to by the word "Universe."

The Second Law of Thermodynamics is a principle learned quite early by students of the hard sciences. In words rather than an equation, it states that no system in the Universe is 100% efficient. Losses always exist. Waste is always created.

Waste can then be defined as that portion of the input to the system that is unwanted by the system, cannot be used by the system, and is therefore returned to the Universe by the system.

Waste is therefore a *natural* part of the Universe.

However, waste unusable by the system is, in fact, poison to the system. The system has to get rid of it because the system cannot exist with the waste. The system cannot exist with the waste because the system cannot use it. Often, a means exists for the system to store it until a time

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and place becomes available in the Universe to dump it.

The nature of waste depends upon several variables.

Because waste is a *natural* part of the Universe, said Universe or larger system absorbs the waste that then becomes available for use by other systems. If a system does not exist to use the waste, a new system will evolve that is capable of doing so.

Waste is also a function of time, of the rate of waste creation by the system, and of the ratio between the rate of waste creation versus the capability of the Universe to absorb it. If too much waste is introduced by the system too quickly, it cannot be absorbed by the Universe and therefore remains in the vicinity of the system as an accumulating amount of poison.

Thus, the late Theodore Sturgeon was reflecting the reality of the Universe when he stated, "Ninety percent of science fiction is crap; in fact, ninety percent of everything is crap." Sturgeon's universe apparently had a lower efficiency than the one I see around me.

Thus endeth Lesson Number One. It was set forth in neutral terminology without resort to any of the current words and phrases that are loaded with emotion—pollution, garbage, recycling, or environment, for example.

At the risk of triggering emotional responses, let's take a look at the definition of "pollution" in light of what has been written here thus far: "Pollution" is unusable energy or material ("waste") that has been created in less time, in greater quantity, or a combination thereof than the Universe can absorb. This includes all forms of pollution—even that which has been created by human beings—that hasn't existed before and therefore has no natural means of being absorbed by the Universe at that time; it will be absorbed, given enough time.

Human beings have a saying, "One person's garbage is another person's treasure." This is also true of the Universe. Since all waste is a *natural* part of the Universe, the Universe accepts the waste because it either can be used by another system, *or*, given enough of the waste, a system will evolve that will use it.

This is especially true of the system we call "life," which is a system. It produces waste that takes the form of both waste heat and waste materials, Sturgeon's crap. Even the lowly amoeba produces crap.

The presence of life in a system changes the system. It always has. The anaerobic bacteria that first lived on Earth produced a growing amount of waste: oxygen, an element that is chemically active. The presence of life on Earth destroyed the then-existing environment. The atmosphere changed from one primarily composed of carbon dioxide to one that is 21% oxygen. Anaerobic bacteria continued to exist, but they were far outnumbered by the more energetic oxygen-using life forms that were more active because they could utilize the more energetic chemical reactions involving oxygen.

At the top of this chain of organic life forms are human beings. They

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produce waste. Too much of it in too small a volume in the presence of human beings is "pollution."

We know how to handle waste very well, else we never would have survived.

For example, the Chinese build their privies over pigpens. Human waste is porcine treasure. Then humans eat pigs. We appear to have no emotional problems about eating pigs that have eaten our offal. More Chinese exist on Earth than any other peoples. Ergo, it must work.

Among people who are primarily urbanized, the human waste is called "sewage." The technologies that we have developed to handle sewage so it doesn't cause disease are old, well-developed, and eminently workable. The Roman engineers were very good at this. They had to be. Large, high-density urban populations simply cannot exist without the results of good civil engineering. (That's what the term means.) When the Roman Empire came apart, this engineering fell into disuse in Western Europe because people moved out of the cities to escape the tax collectors. The traditions and technology continued in the Byzantine Empire.

Most cities were located on rivers for two reasons. First, rivers were trade routes, and the purpose of a city is to serve as a node of a trade route where markets, warehouses, etc. can be built and protected by a police service run from the city. Second, cities were located on rivers because the rivers were both a source of water and a means of flushing the city of wastes.

Unless the civil engineering is very good and the political organization keeps pollution management under control, a city will die within a few generations or when the population density grows beyond the point where the reservoirs and sewers can handle the demand. In fact, more cities have fallen to pollution than to military siege.

I've seen many examples of this in the American Southwest where I live. The region is covered with the ruins of Amerindian cities. Mesa Verde is an excellent example of this phenomenon. I've pondered why such conurbations, large for the time in which they were active, were apparently abandoned, often apparently in haste. The prevailing views include (a) drought forced the inhabitants to find a new city, (b) the crops failed because of overuse of the land, and (c) the cities fell to military action.

However, looking at these from the viewpoint of a civil engineer—I am not a civil engineer, but my brother-in-law was and I have many close friends who are—it occurred to me that the archaeologists may *not* have looked at these abandoned cities from that perspective.

It could be that these Amerindian cities were abandoned because their primitive sewage systems, what there was of them, failed. Thus waste built up over time to the point where the inhabitants had to abandon the place and move on. Or to abandon it for a century or so until the wastes had been recycled, thereby allowing them to move back.

People whose ancestors were born

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in the teeming cities of Europe, Asia, and the Indian subcontinent are progeny of those whose physical constitution was such that they survived these stinking, pestilent hellholes and had the smarts to learn how to handle the worst sort of pollution that has always haunted us as human beings: our own wastes. A millennium ago, an urban area of 100,000 people was a large city, although the population density is also a factor in determining this. Today, that's grown to 10,000,000 people, indicating that humans are pretty damned good civil engineers. These conurbations simply would not exist if we were not.

We know how to handle our own waste products. We've built water supply systems to provide the critical ingredient for an urbation. We know how to build waste recycling systems all the way from septic tanks to major sewage treatment plants. They work and their existence as working systems permit us to live as we do in Europe, America, and Asia. We learn fast. As organisms, we are very good at handling our own waste so that the Universe recycles it. Otherwise, we would not be here.

Civil engineering has never been one of the popular or trendy fields. But it's there, and civil engineers go quietly about their work building the systems to supply us with our physical needs and to handle our physical wastes. We tend to ignore them because what they build *works*. It's only when they *fail* that we notice it.

But because of news media coverage, many people who don't know or understand engineering believe that the world is now full of garbage ships looking for a place to dump their loads, that the air is so fouled that acid rain is destroying all woodlands, that our ocean-dumped garbage is poisoning the sea water, that our industry is destroying land, sea, air, and space. This viewpoint is parochial, non-technological, and incredibly presumptive.

It's parochial in the same way that an infant sitting there with a full diaper is parochial, never mind that the situation only a few feet away is different.

It's non-technological because science and technology are such dreary subjects that most schools no longer teach them, preferring instead the romantic approach to life as Robert Persig defined it in *Zen and the Art of Motorcycle Maintenance*. This is also known as the devotional school of technology. I mean, like, man, now the way to get something is to wish real hard for it, you know what I mean?

It's incredibly presumptive on the other hand because people don't understand that we are *not* omnipotent, omniscient, and infallible technologists. That our technology is *not* so all-powerful that we can indeed destroy the Earth with it. (Yes, we've *always* been able to destroy ourselves with technology, going back to the early technology of fire which still kills and destroys.) Gods with machines we are *not*. Yes, the world has a disturbing number of crazies out there, but not a single one of them is willing or capable of a scorched earth policy beyond the local area. We've just come through a period in which

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we indeed could have destroyed everything on Earth with only six cobalt-cased 10-megaton thermonuclear detonations. But when those who could have caused this to happen came right up to the edge, they didn't do it. Some day, the full story of the Cuban Missile Crisis will be told.

In learning to be civilized—e.g., learning to live together in cities—we've always had to strike a dynamic balance between individual freedom of action and subservience to authority. It's happening even today. Those who want to preserve as much personal freedom of action as possible are pitted against those who want the greatest possible control over personal freedom of action. When we're successful in doing this, we strike a balance. We reach a consensus. We make a social contract. It doesn't last. It never does. Technology progresses. People's perceptions change. Our desire to live in conurbations of increasing population density is an ongoing historical trend. So we constantly grope for new and better solutions to the biggest problem we've always faced: pollution.

If it seems to be worse today than in the past, look at it this way: In the seventh month of pregnancy, the womb begins to get crowded and levels of waste products build up as they never have before. In the eighth month, the situation gets much worse. If the unborn child could make a forecast, it would become obvious that by the tenth or twelfth month, no room will be left and the pollution level will become deadly. Something is going to happen.

And in the ninth month, it does.

So take an alternate view: Maybe the human race is about to be born into a bigger system, the Universe.

Can we pollute the Universe? Maybe in a few thousand millennia. But by that time, who knows to what level we will have evolved? Olaf Stapledon and Arthur Clarke are but two writers who have considered this.

But please don't bewail our fate here on Earth dying in our own pollution. Maybe we'll be like the Amerindians who abandoned their cities in the Southwest. Maybe this planet was made to be despoiled and abandoned, forcing us to move on to some larger system for some purpose we know not at this time. That's heresy today, of course.

Robert A. Heinlein made an observation that few people liked or understood: "We've just about used up this planet. Time to go find a new one."

See what happens when you take an alternate view of pollution? ■

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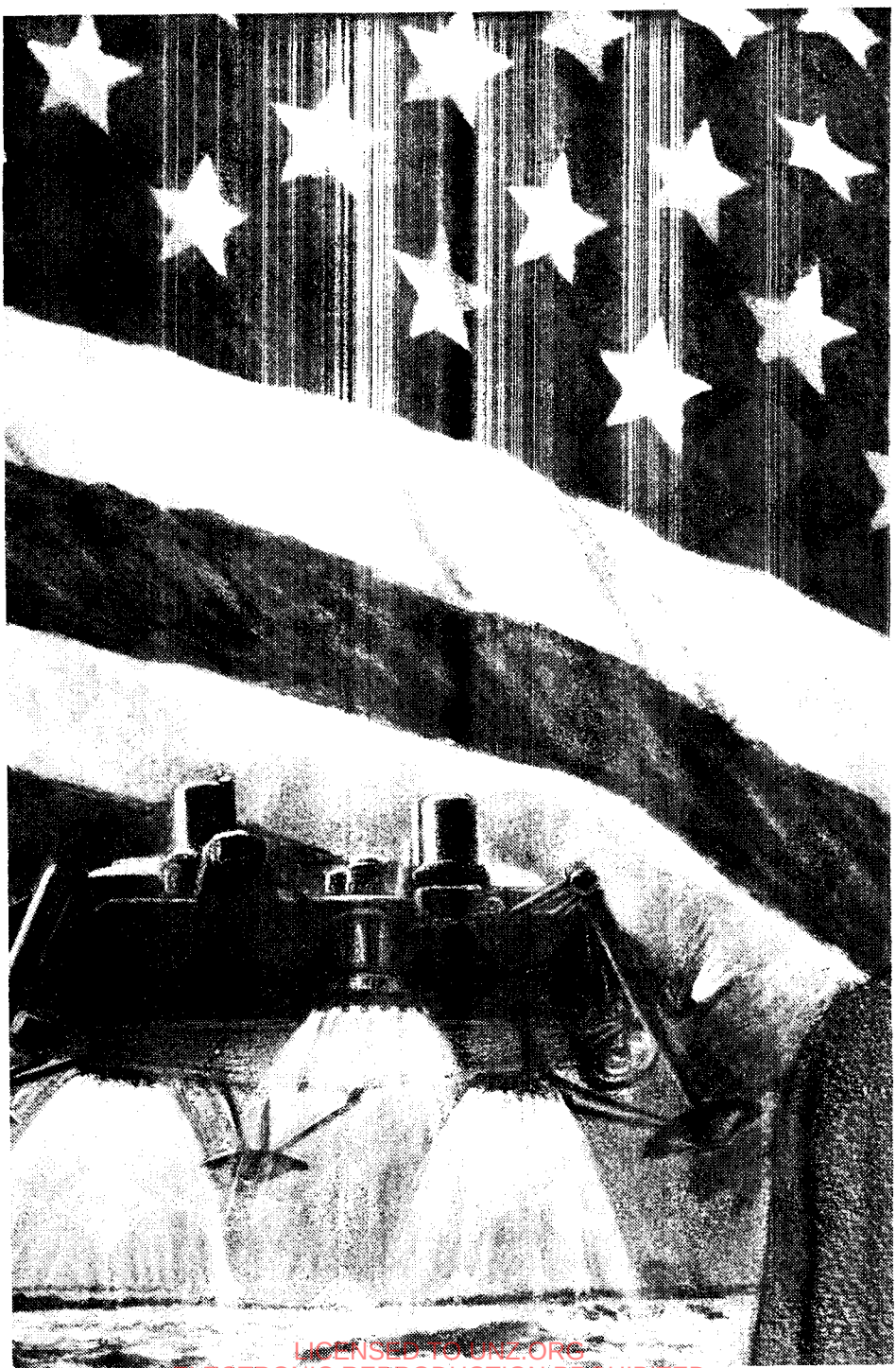

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Daniel Hatch

SENATOR SPACE CADET

Changing technology will inevitably change politics —and vice versa!

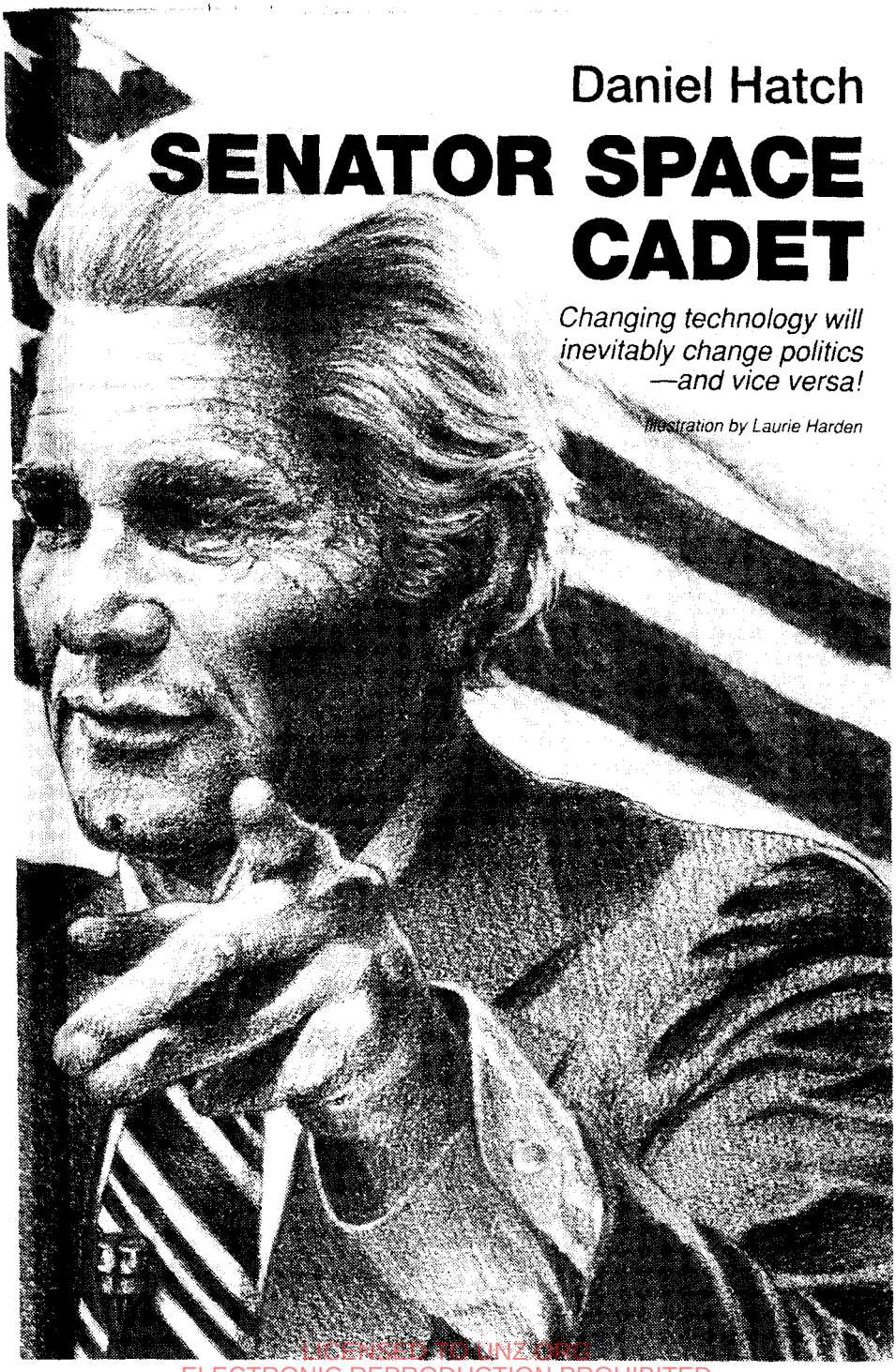

Illustration by Laurie Harden

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The Baby Boomers finally came of age politically in the last decade of the 20th century with the election of Bill Clinton and Al Gore.

Over the next decade, the children of Vietnam and Watergate replaced the veterans of World War II in positions of power throughout federal, state, and local government, and their idealism and drive to reform changed the face of American politics forever.

By the end of the century, the Boomers' reforms had swept the nation—the abolition of the tax code and the creation of the flat tax, campaign financing reforms, term limits, presidential primary reforms, congressional reforms, bureaucratic reforms.

The reformers never realized that they were preparing the ground for even deeper changes. They couldn't possibly have foreseen the fragmentation of the political parties or the Crash of '02. But to their credit, the reforms provided the nation's political institutions with the resilience to meet those new challenges. . . .

—Tom Felden, Politics for a New Century, *New York, 2011*

January 17

Jan McIntyre went to a newt bar in Nashua to watch the debut of the commercial on local television.

She ordered coffee—she'd been running on six hours sleep a night for far too long—and when the waiter came, she handed him a C-note, folded so the big picture of Lincoln on the right end of the bill covered the red, blue, and yellow design on the left.

"Could you do me a favor and make sure the TV is tuned to Channel 9 at 7:55, for about five minutes? There's something I want to watch."

The waiter, a college-age youth, who kept a book open on the bar when he wasn't running to the tables, smiled and nodded as he pocketed the bill.

She stirred too much sugar and an Amaretto-flavored creamer into the coffee, and sipped it cautiously. Then she pulled the phone out of her purse and started making calls.

She had to make sure that half a dozen advance men had done their work on the senator's upstate tour in midweek. After talking to each of them, she phoned her computer back at the motel in North Andover.

"Thursday, North Conway Chamber of Commerce, 1 P.M." she told the machine. "Miller's Alpine Restaurant. Route 308. Expecting a hundred local businessmen and local press. National press will be traveling with the senator. Record this in voice-mail and update schedule files."

The computer burped and replied: "Job done."

For a moment, she felt poised on the edge of overlaying manifold realities. There was the immediate and material one before her—hanging plants, waxed wooden floors, polished glass tabletops. And outside there was the wider world of Nashua—highways, streetlights, houses, factories, and stores. But in the past couple of months the high-pressure, high-intensity world of the Tyler campaign that had swallowed her up made all of them seem trans-

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parent and insubstantial.

This quiet moment in the bar was the first peace Jan had had in more than a week, and it would be over far too soon.

The place was empty when she first arrived, but it began to fill slowly. She looked up when a party of newts arrived, talking fast and laughing loud. At least someone had something to be happy about—and time to enjoy it.

New Hampshire's economy had been in a shambles since before the Crash. Ten years later, thousands of workers in the bigger cities still depended on the Emergency Worker Protection Program to keep them alive. The only bright spot in the state was here in the south where the growth of new-tech firms—cybernetics labs, bioengineering centers, software shops, and the like—had brought anything like prosperity.

She'd picked an easy house for the debut. Eddie Bligh had gone on to a blue-collar bar up in Manchester for his review, a tougher crowd to please. These newts weren't bitter and frustrated and suspicious of every politician who came to New Hampshire this winter.

From where she sat in the back of the room, she had a perfect view of the Hi-D TV screen that filled one wall.

As the clock pushed up towards eight, she grew nervous. She'd seen the commercial enough times already—in the studio in Boston, at campaign headquarters in North Andover, and at the TV station in Manchester. But this was opening night with a live audience.

The placement had been carefully planned. It was scheduled for the station break just before prime time, just before the hockey game and right after one of those disgusting true-confession shows. First came a thirty-second plug for a vegetarian dog food, then the Tyler spot.

Her heart beat faster when the screen faded to black and a montage of fire, smoke, and rocketships appeared—the Saturn V moon rocket, the space shuttle, the spaceplane, and the Delta Clipper. Old shots of space station Freedom rolled by, a space-suited astronaut climbing along the structural beams; that was a computer-generated image and not real video, though it was impossible to tell.

After a few seconds of pictures, after the roar of the rockets faded, Senator Joe Tyler's voice could be heard.

"Space—the greatest adventure," he said. The timbre of his voice conjured up memories of long-forgotten TV programs. "And one that has been neglected for too long."

More computer-generated images appeared of a moonbase that had never been built.

"For too many years, we have turned our backs on the future," the senator continued. "For too many years, we have squandered our heritage and wasted our energies."

Computer graphics of interplanetary ships that had never flown pulsed with hot plasma.

"Half a century ago, America was challenged to become the leader in

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space. But too many opportunities have been missed and too many chances have been lost. Today we are the heirs of a squandered heritage."

Now the senator appeared, standing behind the podium at M.I.T. where he'd given his speech on Monday with blue drapes behind him and photo enlargements of proposed spacecraft on either side. The camera moved in on his face.

Jan looked around the bar. The patrons were hooked. No one spoke. No one even breathed. They were all caught up in the larger-than-life illusion that only Hi-D TV could create—the ultimate extension of video technology.

On the screen, Tyler's face had grown to fill the wall. White teeth, clear green eyes behind designer bifocals, lines of worry and wisdom around the eyes and mouth, his grey hair curling slightly over the tops of his ears to remind the older voters that he was still a Boomer, even though he had just turned sixty last fall. He projected sincerity and radiated warmth and concern.

"The time has come to make up for many lost years," the senator said. "The time has come to make the next great leap towards the future. But this time, we will not be going as scientists and explorers. This time, we will go as workers and businessmen, as builders, miners, entrepreneurs. The time has come to use space to our advantage—not as a military high ground, not as the province of academics and scholars, but to bring home the wealth of unlimited resources, the distillation of unlimited energies, the bounty of God's infinite skies. To invigorate and energize our nation, to seize the future for our children and our children's children, and to create millions of new jobs in the next four years."

Tyler's face was replaced with images of solar-power satellites, mass drivers on the lunar surface, giant nuclear-powered rockets pushing asteroids across the sky. Nothing that the viewers couldn't see in the latest space opera, but startling in a political ad.

"When I am elected president, I will make the industrialization and exploitation of space—of the Moon, of Mars, and of the asteroids—the first priority of my administration. Not exploration, but exploitation. And not just for our generation, but for generations yet to come."

The commercial ended with the blue and red background of their campaign colors and a picture of Tyler smiling broadly—to soften the seriousness of the speech. An invisible brush swept across the screen, painting the words: "To the stars with Joe Tyler!"

The screen faded to black and a moment later the hockey game came on.

Jan drank her coffee, smiling at the technical elements of the commercial. As Tyler's campaign manager, she would have to answer to the senator if something had gone wrong. She was relieved that it looked as good on screen as it had in previews.

Now if only she could get over her fear that the whole idea was a gigantic mistake. . . .

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* * *

She had tried to convince him of that over the weekend, before the M.I.T. speech.

Much of the time the senator took her advice, but not now.

She'd been with him for eleven years. He had hired her as his press secretary when he first came to Congress—taken her from her dead-end job in that dreadful little newspaper at the wrong end of the state. She had been with him through three campaigns, once for reelection to his congressional seat and twice for the Senate. She'd run both of the Senate campaigns.

About half of what she knew of politics, she'd learned from Tyler. That was why he listened to her so often. The other half she'd learned from her father, who'd taught her how to be a reporter from the time she was big enough to reach a keyboard. To this day, he was still giving lessons on politics with his editorials at that dreadful little newspaper at the wrong end of the state.

They'd thrashed it out in the campaign suite at the sprawling motel in North Andover, the smell of chlorine from the swimming pool outside the door filling the room and burning her nose.

"Why are you doing this?" she had asked Tyler. "You've got everything going for you. Your position on the issues are perfect for this election, your record is impeccable, and you've spent more time in New Hampshire than any two of the other candidates. Believe me, space is not an issue for this election. You're twenty years ahead of your time."

Tyler had just smiled as he paced nervously around the suite. Jan knew that smile, and it always gave her the shivers. At sixty, Tyler was a child of a different age—much like her father. He'd grown up in turbulent times when it was easy to gamble everything on a dream, when it seemed like anything was possible. She was twenty years younger than the senator and her own experience had made her cautious, cynical, and, to her own way of thinking, more practical.

Sometimes she felt like he was the youngster and she was the old-timer.

"I can't wait twenty years to do this, Jan," he said.

She snorted derisively. "You've got to come up with a better reason than that."

Tyler stopped and sighed. For a moment she could see the young spirit that still burned within the aging body.

"Look, Jan, without this issue, I'm just one more hack pushing the party line. There's a consensus out there about what we should do. It's not exciting, it's not dynamic, and it's not bold, daring, or ambitious. It's boring, and the last thing I want to be is boring."

"Why can't you just issue a position paper on space and leave it at that? Why do you have to make it the center of the campaign?"

"Remember the first time we came up here, back in '04? Just you and me and Eddie driving around New Hampshire in an electrovan, trying to make it uphill going twenty miles an

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hour?"

She did. It had been an education: politics up close and personal, talking to small groups of people in their homes and on the streets. It was big-time politics brought back to its small-town roots. She nodded cautiously.

"I could tell when I was getting through to people. This time it's been different. They don't listen anymore. I'm boring the hell out of them. I don't want to do that. I want to do what I believe in. And this is what I believe in."

"And you think this is the only way to avoid putting the voters to sleep?"

"No. There's all kinds of ways I could wake them up in a hurry. I could tell them about Kondratief cycles and the world power cycle, and all the other studies that get kicked around in the back halls up on Capitol Hill. I could tell them that all the experts think there's a major world crisis coming in the next decade —maybe another world war, what with China and India coming into their own. I could tell them that America is at risk of losing its position as the most powerful nation on the planet—and that we're not going to like whoever it is that replaces us."

Jan shivered at that thought. There was too much truth in Tyler's words. Her father had told her once that politics was a lot like a striptease act —you couldn't reveal everything, or you wouldn't keep the crowd's interest. She'd learned on her own that too much truth could ruin a campaign.

The kind of truth that Tyler was talking about was the kind that was too powerful for politicians to deal in. That was what they had staffs for.

And Tyler was right. Telling people that particular truth, that all kinds of so-called experts were predicting terrible things for the future of the country and that no one was certain enough that they were wrong to contradict them, was always a big risk for a politician. Bigger even than proposing an all-out program for the conquest of space.

"But we both know that's not likely to get me this party's nomination," the senator continued. "So that means I have to do what I think is best to point us in the right direction to head off that crisis, and to keep us strong and powerful when we need to be the most. And that means no more fiddling at the margins—we need to do something radical, something real. I truly believe that a substantial American presence in space is the one thing that we truly can achieve that will do all that."

"Does that mean I can't change your mind?"

"That's exactly what it means."

"Even if I think you're setting yourself up for a disaster?"

He frowned, looking crestfallen. "Do you really think that?"

"I don't know, Joe. I just think you're chasing a dream. I don't think enough people will share it to make it pay off."

"Then I guess I'll just have to do something to get them to share it."

She'd seen the sparkle in his eyes then. It was the same sparkle that her father got when he decided to take on some big shot on the editorial page.

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She'd known at that moment that there was no way she could alter his determination to do what he wanted. The only thing she could do was make the best of it and hope he was right.

For what it was worth, the newts loved the commercial.

"It's about time," said one young man who sat with three women at a table near the bar. He looked like one of those sharp-mouthed boys Jan had gone to college with—the kind who thought they knew everything at twenty-two. "Someone should have done that twenty years ago."

Jan smiled. That was the reaction she'd been hoping for.

"Oh Kenny, that's silly," said the woman next to him, a small blonde with over-curled hair. "Why waste our money in space when there's so many problems here on Earth?"

Kenny launched into a long-winded explanation that would have impressed the senator himself. For a moment, Jan's doubts about the whole plan faded. There really were people out here who believed in this stuff.

She was distracted from the conversation by the quiet beeping of the phone in her purse. It was Eddie Bligh.

Eddie reported on the reception the commercial received in Manchester.

"The dolers liked it," he said. "They thought it might mean new jobs for the techs and engineers. And someone told them that if the techs and engineers get the tech jobs, then that means more real jobs for guys like them."

"Did someone tell them that's in the next commercial?" Jan asked with a laugh.

"I didn't have a chance. Tom Felden from Net News got there. I figured I'd done enough shilling already without making it too obvious."

Tyler's press secretary had come late to the senator's staff after kicking around Capitol Hill for quite a few years. His first job in Washington was for Interstate Cable News—not much pay, but lots of connections. He'd done press work for a dozen congressmen, but he never stuck with one for long. In an unguarded moment, he'd told her that he couldn't stand to tell other people's lies for them, but he loved the electric crackle of power and couldn't walk away from it.

"What did Felden think?" she asked, feeling a brief rush of fear.

"He liked it," Eddie said. "He also thinks the senator has lost his flipping mind. He asked me what the old guy's been smoking."

"Great. And he saw you priming the dolers?"

"It wasn't that bad. I just bought a few guys some beers and told them that Tyler wants to go back into space. Pointed out how that might be to their benefit."

"Jeez, Eddie, it's not like they're newts."

"Well, you know the plan. Millions of new jobs in four years."

"I know that's the plan, but first we have to get him elected."

Eddie laughed. "No sweat, sweet-

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heart. We've already got everyone beat in the outlying precincts. Tell me again—how many voters are there on Mars?"

The U.S. space program stalled in the Crash, a victim of the dollar drain, hyperinflation, budget cuts, and the last phases of the nation's military demobilization.

Even the infusion of Russian technology and the spur of Japanese and European competition wasn't enough to rescue it.

The sad truth about the American venture in space was that it had always been tied to the whims and desires of whoever occupied the White House. Like Queen Isabella of Spain, it was up to the president to ransom the family jewels to support that kind of wild and speculative exploration. . . .

—Aerospace Quarterly, November 2010

January 18

The next day started out well enough.

She and Eddie had fielded calls for most of the night about the commercial and Tyler's promise to put the space issue at the center of his campaign. No one was calling him a lunatic, at least not in public. But Jan had talked to a few of the senator's backers who questioned his judgment.

It was hard not to admit that she shared their fears, but she'd spent enough years in Washington to know how to lie gracefully and smoothly. None of them would have guessed for a minute that she and Joe Tyler disagreed on this.

She finished her morning coffee and got the electrovan warmed up. Then she came around to the front of the motel to pick up Tyler, Eddie, and the four reporters who were following them for the day. A second van carried a Satellite News Service producer and camera crew. They were a recent addition to the entourage—a sign that the space commercial had been noticed.

They bundled in quickly to get out of a brisk wind that had blown straight down out of Canada overnight. The world may have gotten a lot warmer in the past decade, but January in New England could still be bitter and raw. Then they headed up I-495 to catch 93 and the road into New Hampshire.

The first stop was a high school rally in Bedford. The kids couldn't vote, but they always got real excited when a presidential candidate showed up, so it was a good way to the start the day. The gym was already full when they arrived, and everyone was waiting for the senator.

Everyone included Tom Felden from Net News. Jan smiled at him when she spotted him standing to one side of the bleachers. He smiled back, then the kids went wild, cheering for Joe Tyler as he walked up to the podium, followed by the Satellite News camera crew with their bright TV lights and the big Hi-D camera.

Tyler waved, the school band stopped playing, the kids quieted down. And then, from the top of the bleachers, a big, blond athletic-looking kid stood up, cupped his hands,

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and broke the silence by shouting: "Go for it, Senator Space Cadet!"

Jan gasped, opened her eyes wide, and looked up at Tyler. The senator didn't miss a beat, but waved and smiled before beginning his speech.

Then Jan looked over at Tom Felden. She prayed for a moment that he hadn't heard it, but the reporter wore a grin as wide as the Cheshire cat's.

By the end of the day, after the Satellite News team flashed the kid's greeting across the country, all she could remember was that big smile.

During the long years after the end of any true U.S. space program, the dream was kept alive by private organizations of true believers, who had grown up with the hope of seeing colonies in space, rockets on the Moon, and regularly scheduled spaceliners to the planets. Some of them supported research through various astronomical institutions. Others lobbied a reluctant and unyielding Congress, pressing for funds that never came. A smaller minority actually did things.

There was the privately financed attempt to develop a single-stage-to-orbit rocket that ended disastrously one afternoon at White Sands, New Mexico. And there was the Phoenix program where a non-profit foundation built and maintained its own space station in an empty fuel tank from the space shuttle.

But the most successful and long-lived of these groups was the Solar Sail Society, formed at the end of the 20th century and showing every sign that it would survive well into the 21st.

—Howard Francis, The Dream That Wouldn't Die: America in Space, *Boston, 2011*

January 26

Jan hurried through the glass doors of the Solar Sail Society headquarters and followed the beckoning of a Secret Service agent down the side corridor that led backstage. She was almost out of breath when she arrived at the door.

In politics, Jan knew, a week could be an eternity—especially if people were making fun of your candidate—but it was barely enough time to organize this event.

Satellite News had run the "Senator Space Cadet" sound-bite over and over again. Tom Felden had put it in his weekly column. And, worst of all, people had started calling Tyler that whenever he appeared before the voters.

Sunday night had been the worst—a cattle call in a cramped seafood restaurant in Portsmouth, across the highway from the former Pease Air Force Base, now Pease International Airport, the air-freight capital of New England. There was no way to ignore these people—they were well-dressed and well-fed and, in the days before full public campaign funding, they would have been the kind who donated buckets of cash to the campaign. Now they offered only influence, which was plenty in a small state like New Hampshire.

The senator had been up at the long table with the other candidates, and Jan McIntyre, eavesdropping

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from the back of the room, heard it every time someone used the words—Senator Space Cadet.

Well, after today, one way or another it would be over.

There were two ways to deal with ridicule—an easy way and a hard way.

The hard way was to convince people that you were not ridiculous. Joe Tyler had been trying his best to do that since the moment in the high school gym. He truly believed that if only the voters realized that he was deadly serious and that his program was not some kind of pipe dream, they would stop making fun of him.

Today's event would be the most visible attempt to do that so far.

The fifteen-year-old Solar Sail Society was sort of a combination of the National Geographic Society and a pack of radio-controlled airplane enthusiasts.

They'd been putting their little sails on cheap rockets for more than a decade, watching them unfurl in orbit and catch the solar wind, then ride that wind out through the Solar System. The steady acceleration of the Sun's flood of photons boosted the sails up to mind-boggling velocities. They could get to Jupiter in six weeks. In the last few years, they'd been sending the sails through the asteroid belt, taking snapshots as they slalomed around the little rocks at breakneck speeds.

NASA was not happy about the way the amateurs in the Solar Sail Society regularly upstaged them. But in the course of fifteen years, they'd learned to live with it.

Jan was nervous about using them, considering the chances she was taking—it would be very easy for the newscams to give the wrong impression of the society's membership. But they were as eager to get the public and vocal support of a senator and a presidential candidate as Jan was to put her candidate in a favorable light.

The society was based in a modest brick building in New Carollton, just down the road from NASA's Goddard Space Flight Center. One reason Jan had picked it was because it was at one end of the Metro and accessible to most of the Washington press corps. But she suspected that most of them were here looking for more fodder for their gossip mill: pictures of Senator Space Cadet talking to the sail-jockeys.

She hoped to give them that—and more.

The speech went well. It was pretty standard stuff, for the most part. Laudatory comments on the long years of effort that had gone into perfecting the art of solar sailing. Praise for the society's contribution to space exploration. Then the plug for his own plan.

"I see a day when solar sails ten miles wide speed across the Solar System, carrying men and women of vision, like you, to their new jobs in a new century. A day when your work is seen as one of the foundations of a great new future for all humanity. And with your help, I hope to make that day come sooner, instead of later."

The applause from the society members was unrestrained. Jan was happy enough with it, but not with

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the society itself. When she'd told them her plan, they wouldn't go along. They said they didn't want to get involved in partisan politics by appearing to support one candidate over the other. That was all right, she'd get what she wanted anyway. And besides, the lighting was better out in the parking lot.

She'd invited Tom Felden down from New Hampshire, and Satellite News was there with the cameras. When the speech was over, she had Eddie Bligh buttonhole the journalist and drag him outside. Cameras were already set up when the senator got there.

She led him to the microphone stand, waited for the crowd of reporters, society members, and onlookers to gather. When they were all in place, she signaled to bring out the others from the bus where they'd been waiting.

"Senator Tyler, we just wanted you and some of the members of the press to meet the latest supporters to join your campaign," she said, as they filed across the parking lot.

There were at least fifty of them. First came the kids—high school and college students bouncing with nervous energy. Then the adults—some of them were Tyler campaign workers, others were newts and society members—looking a bit nervous and self-conscious. Bringing up the rear was a small group of older men and women who walked with an unshakable dignity that seemed to set them apart.

Each and every one of them wore a blue sweatshirt. On the back of each was the campaign logo and the words "Tyler for President." On the front, in bright red letters framed with a graphic design of a rocket ship atop a blaze of fire, were the words: "Space Cadet."

Much to Jan's surprise, it turned out that a lot of people liked the senator's ideas and wanted to help. The more enthusiastic of them were kids—kids who still believed anything was possible if you just got excited enough, Jan thought sadly.

"We're Space Cadets for Senator Tyler," the youngsters shouted in unison as they lined up behind the senator.

The adults were more restrained, but they waved and smiled for TV.

But the big punch that Jan was counting on came last. When some of the reporters recognized the group bringing up the rear of the procession, they began to get as excited as the schoolkids. The stragglers came up to the microphones to shake Tyler's hand and stood in front of their young companions—and the photographers went wild with their digicams.

The first in line was Tom Boudreau, the last pilot of the space shuttle *Endeavour* before it was decommissioned. "I'm a Space Cadet for Senator Tyler," he said with solemn pride.

Four more former astronauts followed, including two from the Lunar Expedition, one from the last days of the Freedom station, and one white-haired veteran of the Apollo program, still going strong in his seventies. "I'm a Space Cadet for Senator Tyler," he said.

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After the astronauts came two television actors—the star of the current top-rated space opera and an aging woman who had once portrayed a crew member of a starship that still sailed the skies in syndicated reruns.

And at the end of the line were a pair of well-known authors of space fiction. "We're all Space Cadets for Senator Tyler," they said with wide grins.

This was the easy way to overcome ridicule—take it away from your enemies and use it to your own ends.

Tom Felden was right up there in the front of the crowd, next to the camera men and photographers. He was wearing the same grin he'd had in New Hampshire. But when Jan caught his eye, he waved and shook his head.

She decided the event had been a success, at least for the moment.

But in the end, she still hadn't convinced Tyler's biggest critic—herself.

Andrew Miller was not to blame for a lot of things that happened to this country in the opening years of the century.

It was not his fault that the plane carrying President Green crashed while landing in Denver in January of 2002. It was not his fault that the fragile structure of banks and financial institutions papered together during the '90s was not capable of bearing the load of 21st century commerce. And it was not his fault that the GOP shattered irretrievably into the Conservatives, Farmers, Libertarians, and old-fashioned Republicans in the aftermath of the Crash of '02.

—Jeremy Malik, Too Much Job, Not Enough Man: A Political Biography of President Andrew Miller, *Boston, 2008*

February 11

Despite heroic efforts to keep up appearances, the high school in Manchester showed the signs of age and neglect: dented or missing lockers along the hallways, ceiling panels replaced with white cardboard, and red cellophane over the exit signs. But there were touches of care and warmth—handmade posters announcing ski trips, dances, and car washes, murals painted on the walls by generations of students long since departed, and glass cases full of hard-won trophies and prizes.

The place gave Jan a reassuring sense of security, as if she'd been transported back into the tightly ordered world of adolescence, far from the ravenous world of high-power political competition.

Tonight, however, this would be the scene of one of the set-pieces of political combat—a full-scale open debate among the candidates. Ordinarily, Jan would be looking forward to the event with all the trepidation of a rock climber jumping into a cave full of rattlesnakes.

But not tonight. That was because this debate was being sponsored by the Republicans. Not everyone up on the stage belonged to the GOP, of course, but here in New Hampshire, there were still only two parties. The only accommodation they made to the century's new political order was to let the candidates from the splinter

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groups join the mainstream guys and slug it out to see who won. It was partly Yankee ingenuity and partly keeping a keen eye on retaining the state's national role in selecting a leader—after all, with only one exception in the last seventy years, the man who finally made it to the White House had been a winner in the New Hampshire primary.

"Aren't you here a little early?"

The voice beside her startled her a bit. She turned and saw Tom Felden, his press ID tags hanging on a chain around his neck and his thick glasses flecked with drops of melted snow. "I mean, you're not due here until Thursday."

"Shhhh," she said in a conspiratorial whisper. "I pulled some strings to get a ticket to this and if anyone finds out, we'll both be in trouble."

Felden smiled and nodded. "Scouting the competition?"

"Of course. It pays to stay one step ahead. If we win—when we win the nomination, we're going to have to go up against one of these guys. The time to start planning for that is now."

"Naturally. And who do you think that's going to be?"

"I'd be foolish to put my money on anyone but the president at this point," Jan said. "But if he doesn't make it, there's that fellow from Alaska who's been making quite a splash. . . ."

"Governor Bart? You may be right. On the other hand, you could just be fooled by the sudden and momentary infatuation we've been having with him on the press bus. You know how we get after we've been cooped up for a few weeks in Holiday Inns and Redhound buses—we're suckers for anyone with a pretty face and passing acquaintance with the proper use of the English language."

"That's all it takes to win most elections," Jan said, as she turned and flipped her hair girlishly before walking off to the auditorium.

When she left the high school two hours later, Jan was scared. Not just worried, but scared down to the bone. She'd had a sudden vision of the campaign's future, played out on the stage in the middle of the debate, and it chilled her soul.

At first glance, the candidates on the other end of the field from the Tyler camp had looked like six grey men in charcoal-grey suits, all cut from the same cloth, all members of the same small club.

But Jan knew better than that, and as they were introduced and made their opening remarks, the differences emerged from the camouflage of the political uniform-of-the-day.

Willard Anderson, forty-seventh president of the United States by an act of God, was once what was called a "Y-person." A product of Princeton, class of '79, and the Wharton School, he recalled an era when the M.B.A. was master of the world, not just business.

When President O'Brien died of a stroke near the end of his second term, Anderson became the first vice president of the opposing party to take office under the Miller amendment. In the few months since, he had done little damage, but he did have

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the power of the incumbency behind him—if little else.

Close politically and challenging him for the leadership of what was left of the Republican party was the senator from Arizona—Bobby Slade. Where Anderson represented the East Coast establishment, Slade was the favorite of the cowboy capitalists—the entrepreneurs of the Southwest who had moved on from oil to other sources of energy to follow their speculative adventures.

His smile was bigger than Anderson's, his hair whiter, and his sunburn authentic—not the product of a White House tanning booth. When back home, he was given to wearing a six-shooter while riding a helicopter over his ranch. Jan had private hopes that in the middle of the debate, he would pull the revolver from his belt and shoot one of his opponents through the chest. She had private fears that doing so would make him a shoo-in for the presidency.

The two leading candidates from the Conservative Party huddled together at the far end of the stage. California Senator Bryce Williams sat ramrod stiff and never cracked a smile. He was deadly serious about his agenda, which included dismantling the EPA and rebuilding the Army to defend the nation's southern border. Little Tommy Little, a four-term congressman from Mississippi, tried in vain to get Williams to lighten up—calling on the spirit of the Lord to bring all the candidates together. Little's program for the nation included government control over computer and video networks to protect children from corrupt influences and jail terms for book dealers charged with selling un-Christian materials. He had the full support of the On-Line Church of Dixie.

Off in a world by himself was the Farm Party candidate—Nebraska Governor Elmer Bradley. His wistful eyes and soft voice were a dramatic contrast to the amplified video images of the other candidates. But his program of subsidies for family farms and a railnet for grain shipments was about as exciting as watching corn grow.

And then there was the Libertarian. . . .

Compared to the other candidates, Alan Bart, the governor of Alaska, was a breath of fresh air. At least he had new ideas. New, but kind of odd. Repeal the anti-tobacco laws, sell off the U.S. Bank, and charge rail haulers for the construction of new maglev rail lines.

At times, it seemed to Jan that he was running for president of Alaska, not president of the United States.

He was a head shorter than Joe Tyler, but he made up for it in girth. Jan figured it was all lean and no fat. His hair was thin and grey, but his eyebrows were thick and dark, all bristles, over coal-black eyes.

He embodied everything that made his state a romantic paradise—he'd been an engineer, a pilot, a hunting guide, and a lawyer. He had started more than a hundred businesses in his life. Most of them had failed. The few that hadn't had made him rich. He had a reputation for fixing almost every problem that came up between

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one Alaskan and another—a reputation cultivated, no doubt, by an efficient public relations staff.

There was something about Bart that was unlike any politician she'd encountered in all her years in Washington. He wasn't political the way they were back in D.C., but at the same time he radiated power and political strength.

Up there among the corporate hacks and tight-waisted conservatives, he looked like a real man surrounded by papier mâché dummies. Joe Tyler was a wise, sincere, and competent leader, but Jan was afraid he might not be able to compete with Bart's raw sex appeal.

And what really frightened her was what Bart had to say. Parts of his message were too close to Tyler's own private vision—to the truth that he was reluctant to tell.

"This nation is facing a dangerous future," he said when the moderator gave him a chance to go beyond the stale, staged questions posed by a panel of local reporters that reminded Jan of trained seals barking out Christmas carols.

"The world is changing faster and faster. We risk slipping from our historical position as leader of the Western world—and the Western world risks losing its predominance among the rest of the nations of the Earth. That would truly be a tragedy, because we in the West stand for something truly unique in the history of the world—the freedom and responsibility of the individual. There have always been great empires, great civilizations. But before now, they have been based on the power of the state. America is alone in its reliance on the power of ordinary men and women like you and me.

"The question before us is simple—what can we do to preserve our position in the world? What can we do to preserve the singular power and importance of the individual over the state? We can't just fiddle around at the edges of our system. We have to take sharp and drastic action to change the course we are on—because believe me, we are on the wrong course. We are trying to imitate the empires of the past instead of the future. And that way lies the road to dusty death."

Jan recognized the echoes of Tyler's own private words in Bart's speech. Libertarians had always had a reputation for being reckless when it came to bringing impolitic reality into a political campaign. She was reminded again that just enough reality could win an election. The trick was recognizing how much was enough.

And she knew that when your opponent said things you were afraid to say, you were in trouble.

The only spot of light in the whole evening was the effect Bart had on the other candidates in the debate. From the time he began speaking until the end of the event, they had all they could do to keep from being humiliated by the man. And if they couldn't do better than that, maybe Tyler was in a better position than she feared.

When the Republican party splintered in 2002, their long time oppo-

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nents on the other side of the aisle could barely contain their joy.

But they weren't nearly so delighted a few years later when the Social Democrats, the New World Alliance, the Green Party, and the Social Justice Front sloughed off from the main party like icebergs calving off a glacier.

While the results seemed chaotic at first, it had some advantages. In Congress, it meant that many representatives were finally flying under their true flags for the first time in decades. . . .

The impact on the presidency, however, was not as benign. . . .

—Tom Felden, Politics for a New Century, *New York, 2011*

February 13

Less than forty-eight hours later, Jan was back at the high school.

Now it was Tyler's turn to face the lights and begin to hack away at the other candidates like a modern-day gladiator.

The day's schedule had been light, a rally in the morning in Portsmouth, then they'd returned to headquarters. Then the entire senior campaign staff had driven up to Manchester in the bleak winter rain.

Jan stayed with the senator as he was ushered into the improvised Green Room—the home economics kitchen in the basement—and made up for the television cameras. None of that pasty pancake makeup they used when she was young. With Hi-D television revealing every pore and blemish, they needed a liquid base mix that looked more natural than nature.

"How are you feeling?" Eddie Bligh asked her while they were painting Tyler's face.

"You know how I feel about these things," Jan said. "There's no way you can control what happens. There's no way of anticipating what these guys are going to do. I wish we could have skipped this thing."

"Keep smiling," Eddie said. "Just remember—if he blows it, we can all go home at the end of the month."

She sneered at him, but he flashed an evil grin back at her.

The other candidates were there with their staffs and the air fairly glowed with the energy of so many powerful egos. Tyler was the eldest of the group and took the role of the leader naturally and subtly. She watched with a critical eye as he brought them together, drawing them out of the corners where they'd gravitated. He shook hands, clapped shoulders, massaging and manipulating the others with a touch and smile, the way it was done in Washington. She'd always been a little offended by the casual and direct physical contact that made politics work—the phony intimacy and the seductive courtship of power.

She went through three cups of coffee and half a roll of antacids waiting for the debate to begin. Eddie supplied the antacids.

At last the handlers led them down a low-ceilinged corridor and up the stairs, then through a back door to the auditorium. She joined the other campaign aides, nodding politely and sharing small talk as they were es-

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corted to reserved seats in the front rows.

The bright TV lights gave everyone on stage a glow, with something of a halo hanging over Tyler's thinning grey hair. The moderator, a network news anchor, was already waiting when the candidates arrived, and in the few minutes before the cameras came on, he walked over and introduced himself.

Then the house lights dimmed and the spectacle began.

For the first half of the debate, Joe Tyler only made Jan's nerves worse. He said little and remained almost invisible. Certainly his face seldom filled the big HDTV screen above the stage.

Governor Todd Gold of Illinois dominated the discussion for the most part.

Jan didn't like him.

He was all that Joe Tyler might have been, but had managed to avoid—an overgrown Boomer who had gotten grey and fat and old, but who had never matured into the seasoned leader that Jan's boss had become.

He still had the casual blow-dryed look of his youth, stylish clothes, and a hearty smile. But his hair had yellowed around the edges from too many commercials, his clothes had stopped being stylish a decade ago, and the wrinkles around his smile showed it to be overdone. His eyes gave it away, though. They were small and dull and made him look as if he'd just woken up.

He was an old-style politician, pushy, expansive, with a loud, emphatic voice. Twenty years ago, he might have been able to stir the nation. Now he just stirred the air.

He argued strenuously to continue the policies of the late great President William O'Brien—the Emergency Workers Protection Act, the U.S. Bank, worker ownership of factories and businesses. And he wanted the nation's industrial planning boards to accelerate development of maglev trains and hydrogen fuel.

But there was no imagination behind his words, no spirit, just the vain attempt to draw energy from the vision of the party's last leader.

The two Social Democrats weren't much of an improvement.

Tony Vincetti, the congressman from New York City, sent a chill up her spine. She knew him—and others like him—down to the bottom of his shallow soul. He was a user, a manipulator, and a cynical power junkie.

She had tried to track down rumors about the way he treated women on his staff—with little luck, so far. The word was that even after the senator from Illinois assaulted the congresswoman from Florida in the elevator a few years back, he was still way over the line on sexual matters. When she couldn't prove anything, Jan decided that the rumors were more a product of Vincetti's image makers than his behavior. She wouldn't have put it past him to circulate the stories himself just to lend a hint of dark romance to that image—completely deniable, of course.

Politically, he was in favor of extending the dole to another five mil-

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lion families—people with jobs, but who lacked the earnings to send their kids to college or to move up to better homes. His core constituents, in other words. At heart, he was just one more in the endless line of supplicants, like those who had once littered the stairs to Lincoln's office in the White House and who now filled the halls of government from one end of the nation to the other.

Mayor Steven Samuels of Cleveland at least had a credible agenda. He argued for urban reconstruction programs to revitalize his city and others like it across America. But with the bulk of Americans long since having fled those cities, including the poor and minorities who had once been forced to huddle in their decaying cores, his rap sounded as phony as a thirty-dollar bill.

From the corner of her eye, Jan caught sight of Eddie Bligh sticking his tongue out at the Cleveland mayor.

She was angry that Tyler was letting Vincetti and Samuels do so much talking. After all, they were barely relevant to the race. They had already announced their intention to run as Social Democrats. All they could do was act as spoilers for the main line candidates like Gold and Tyler.

After a while, though, her spirits lifted when Tyler began to speak. Softly at first, then more forcefully. And as he got going, Jan realized that he'd been lying in wait, biding his time until he found the opening he wanted.

"You know, Todd, you and Tony and Steve are all making the same mistake. You're looking back at where we've been instead of forward to where we're going. You're treating the political and economic system that we've created like a big machine. You all want to keep it running smoothly just the way it is. Maybe turn up the speed over here or add a few belts and gears over there, but not much more than that. You sound like the main job has really been done.

"Well I look at it like a vehicle, not a machine. Like an old space shuttle, sitting on the pad with smoke pouring out of the vents, ready to climb into the sky. Sure it's a machine—but it's a machine meant to go places. Where do you fellows want to go with it?"

The other three candidates hemmed and hawed, bickering with Tyler and with one another for a while, but dancing around his question. Jan kept her cheers to herself, but she had to bite her tongue to remain silent.

It was Gold who tried to counterattack.

"Gee whiz, Joe, you make it sound like you're the only one with plans for the future. We've all got plans too. At least I know I do. The difference is that my plans are down-to-earth, realistic, and practical. I'm not sure where you plan to take us in your shiny chrome-plated spaceship. Maybe you know of some voters in outer space that I don't."

But Tyler was ready for him.

"Todd, there's a time when people have to stand up and say what they believe in. Sure I'm all for continuing

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the things that have made this country strong. But I think we can do more than just survive. I think we have to dream.

"I'm getting to be an old man—something folks my age thought would never happen to us. Let me tell you something about my dream. When I was a boy, I watched Alan Shepard and John Glenn blast off into space. Neil Armstrong set foot on the Moon the summer that I graduated from high school. The year I finished law school was the year they launched the first space shuttle.

"Those were all thrilling moments, but most of what my generation has seen has been a series of missed opportunities. Once the space race was won, we never went back to the Moon. The shuttle was years late and millions of dollars short, and when the last one was decommissioned at the turn of the century, all they did was have a parade. And I don't even want to tell you what it felt like to be a congressman and lose the fight to save space station Freedom.

"We missed our chance to deal with the Russians when we decided that buying their equipment would make their technical establishment too strong. That's why there's a European space station built by the Germans and the Russians in orbit today. We missed our chance to build the space plane and now Japan's Occident Express ferries corporate execs up to their orbital hotel every summer. And we missed our chance to go to Mars when we canceled the nuclear rocket program—for the third time.

"I don't know about the rest of you, but I think the destiny of our country lies in space. And I don't want to see us make the mistake of missing our last chance to do something to fulfill that destiny."

Applause was supposed to be against the rules, but that didn't stop anyone. Jan twisted around in her seat and tried to see who was cheering. Their faces were dim, but the lights from the stage were enough to illuminate them. Some of them were youngsters, Tyler's Space Cadets who'd been given a block of seats in the rear. And some of them were campaign workers who had been instructed to break the rules.

But what surprised Jan were the dozens of local officials, party leaders, and citizens who had risen to their feet across the auditorium—mostly older men and women, faces wrinkled by time, hair turned grey and thin, but their spirits still bright and alive.

Then she noticed that Eddie Bligh was on his feet as well. She realized that it would look bad if Tyler's own campaign manager didn't join the rest of the crowd. Eddie smiled as she stood up, but she just shook her head.

"Nobody's going to trust either one of us now," she said.

This just in, the early returns from Dixville Notch, New Hampshire, where the votes were counted just after midnight. And it looks like President William Anderson is the big winner with fourteen votes, followed by Gov. Gold of Illinois with eleven . . . and bringing up the rear is one

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vote for Senator Space Cadet. . . .
—Satellite News broadcast, Feb. 28, 2012

February 28

In the end, it was the kids, the Space Cadets for Tyler, who made the difference.

They had come by the hundreds. Each day, a dozen more showed up in Nashua or Manchester or Concord, asking if they could help. They were sent out into neighborhoods knocking on doors, plastering pamphlets across small town squares, recruiting more volunteers on the campuses. Most of them were college students, a few were from high schools, a few were long out of school. Most of them stayed for a few days, went back to classes, then returned to help again. Some stayed for good, camping out in the back rooms of campaign offices across the state. They all burned with the same fire—they all wanted to build a future beyond the bounds of Earth.

Jan had been amazed at the sight of them—Tyler's secret army of campaign workers.

She'd wondered how long it would be before the reporters started to notice them. It was actually a few weeks, thanks to the hermetically sealed environment in which most of the campaign followers lived, locked up in buses and hotels twenty-four hours a day.

"I did the same thing when I was their age," Tyler had told her one day on their way back to North Andover. "Came up here for Gene McCarthy. I was still in high school. I got in trouble for missing a week of classes."

He told her how the kids in that campaign had helped unseat an incumbent president. She stifled a yawn, having heard the story a dozen times before.

And when the votes were tallied, Joe Tyler won the New Hampshire primary with a clear majority of the votes, outpolling all his opponents combined.

With the development of "perfect" computer graphics that mimicked even Hi-D television images, it has become possible to replace live actors with virtual characters, created to match the ideal market for commercial products and the ideal audience for entertainment products.

It is only a matter of time before these techniques are applied to politics. Some day soon, it may become necessary for the voters and the media to investigate a new political figure—not to find some hidden scandal in his or her past, but to determine if the candidate actually has a past.

—Tom Felden, Politics for a New Century, *New York, 2011*

February 29

The next day, Jan was back in her Washington office, listening reluctantly to a little man with an obnoxious manner.

"Believe it or not, most people still think that running for president means coming up with the best ideas for the country and making sure people understand the issues," said the small man with the round face and oversized glasses.

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His name was Gerry Kleinschmidt and he was a mechanic—part computer hacker and part political hack. He was young, not yet thirty, and his suit looked like he'd slept in it—on the train from Philadelphia. His hair was cut short, but it looked like he hadn't shaved in three days.

His white shirt was marked by a faded orange ellipse that Jan guessed to be tomato sauce or salsa.

But it wasn't his appearance that set her teeth on edge. It was his offhand remarks about politics, delivered with absolute certainty and not a hint of doubt.

"Is that so?" she asked coldly. Eddie Bligh had sent Kleinschmidt to her, insisting that the campaign needed him. Jan had taken the train back to Washington to meet him, while Eddie had gone on ahead to open the new office down in South Carolina and was conveniently absent.

"It sure is," Kleinschmidt said. "Issues and ideas aren't what counts. Not in the real world. They're just identifiers. Labels. They let your guy identify himself to the voters and let them identify him as their candidate. The real game is putting together voting blocs. Whoever puts the most of them together wins."

Jan nodded carefully, silently readjusting her opinion of him. She didn't want to show it, but maybe there was something to this odd little man. At least he didn't sound entirely ignorant—just annoyingly overconfident.

"Go on," she said.

"Let me show you what I mean. Have you got a display outlet? Oh good, Hi-D. That'll make this easy." He opened his briefcase, removed a laptop, and plugged it into a socket. A moment later the Trumbull painting on the wall dissolved and was replaced with an array of hundreds of colored blocks, arranged in rows of varied lengths that reminded her of chromatographs.

"This is the American electorate—in a coarse four-bin, fifteen-trait array. You've got more than four hundred blocks, identified by residence, economic status, political rating, and ethnic origin."

A blinking cursor zeroed in on a short row, which expanded to fill the screen.

"Here's your home state, for example. Six blocs—two from the cities, three suburbs, one exurbs. One elite, two white-collar, one new-tech, one service, one blue-collar. Range in political rating from plus-five: Conservatives, to minus-four: Social Democrats. Now all these traits overlap. Minus-three blue-collar voters in the suburbs, plus-five elite in the suburbs, minus-one newts in the city. The trick is to find the right mix of ideas and issues to appeal to the blocs that are most likely to support you. It's a resource-allocation strategy—spend your resources where they'll do the most good."

"Fish where the fish are."

"Exactly. Except that it's not as simple as all that. You've got other players out there. So that means there's no pure strategy."

"Pure strategy?"

"In games theory a pure strategy is one that you can use without consideration for what the other players do.

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Like X always starting in the corner in tic-tac-toe. In the political game, there is no pure strategy. You've got to keep track of what the other guys are doing and adjust your strategy accordingly."

Kleinschmidt hit a key and the original array returned. Jan could pick out the colors and patterns now. The dominant tones were blue and tan—the blue of denim work-clothes and the tan of middle-class suits. Accents of light blue: service workers, and dark brown: African-Americans, dotted the screen.

"And how is this supposed to help us?"

"Well, this is a very coarse array. Just enough to give you a broad outline of what you're up against. There are much finer meshes to run the voters through."

He shuffled in his suit uncomfortably, then loosened his tie. He obviously wasn't used to wearing one.

"For the past twenty-five years, marketing analysts have been zoning the country. Their databases focus things down much closer than this. They've got the country categorized by zip codes—incomes, retail shopping patterns, magazine subscriptions, the works. They've done focus group studies, sociological analyses, polling, interviews, everything you can think of. That means we can fine-tune your strategy practically to the individual voter. Certainly to the point where that voter thinks you're talking to him specifically."

For a moment, she had a mental picture of Kleinschmidt picking up miniature voters with a long pair of tweezers and placing them in a vast collection of bottles. She smiled, then closed her eyes and shook the image from her head.

"Do you have any suggestions for the Tyler campaign?"

"I've run some scenarios with the coarse array—just as a sample of what we can do. Given your candidate's basic political stance—a minus-two on our scale—and the other candidates, your core support comes from blue-collar and new-tech workers in the suburbs and exurbs. Your best bet is to concentrate on their issues and spend your money where the demographics overlap sufficiently to give you good multipliers."

"Multipliers?"

"Yeah, like selling yourself on suburban issues and blue-collar issues at the same time. You multiply your impact on blocs with both traits."

"Can you be more specific? How do you expect us to do in South Carolina, for example?"

"Depends on what your opponents do," he said as he called up the row of voting blocs for that state. "You'd probably want to go after industrial workers up in the Piedmont and newts down near Charleston. I'd have to run some scenarios through the matrix to see what's best."

"What did you predict for New Hampshire?" she asked in a moment of sudden inspiration.

All Kleinschmidt's confidence evaporated in a flash. He hesitated for a long time, then finally said: "To be honest, you weren't supposed to win. You were supposed to lose in a close race to Gold. I showed Mr. Bligh the

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results from our test runs. But we missed Senator Tyler's appeal among independents. It's hard to tell where they're going to go in a state like New Hampshire where they can vote in either primary."

Jan pursed her lips and Kleinschmidt looked nervous and uncertain.

Damn you, Eddie Bligh! She wondered what his game was. He'd kept Kleinschmidt under wraps until after the vote, even though he knew that he was predicting a second-place showing. Was he worried about her morale?

And now he'd sent him up to her even though his numbers had turned out wrong. What did he expect her to do?

She vowed to get even with Bligh—one way or the other.

Meanwhile, Jan was still concerned about the senator's political future. If this mechanic was right, the rest of the political season was going to get a lot worse. What would happen, she wondered, if the voting blocs they needed most didn't care about building castles in space?

"Can you tell me what's going to happen in November?" she asked, hoping to make Kleinschmidt sweat. He did not—instead his fingers began flying across the keyboard.

"There's a lot of uncertainty this far in advance. A lot depends on strategy. There's no pure—"

"No pure strategy. Yes, I understand that."

"Well, the best I can do is give you a range of possible outcomes. Like this—" He let his tongue slip between his lips as he finished entering commands into his laptop, then looked up. "It's possible for your candidate to win an electoral victory on his own, but not likely. He'll probably need the support of at least one of the splinter parties to put together the votes—and even that is a closely balanced outcome."

Jan shrugged. That much she and Tyler had figured out on their own.

But Kleinschmidt continued. "You'll have to position yourselves to win in states like Ohio and Florida where you wouldn't ordinarily have the votes to win. And denying them to the GOP will make it harder for a Republican to put his electoral majority together."

"What about the Republicans? What are their chances?"

Kleinschmidt attacked the laptop again, then waited for the numbers to crunch through. A moment later, he looked up. "President Anderson's the most likely candidate, unless he loses one of the big primaries. And he's likely to have more electoral votes than anyone else in the race. But that won't be enough to give him a winning hand without adding in enough splinter votes. And it's a lot harder for him to do that than it would be for Senator Tyler. He'll have to go after the big states and get the support of the Libertarians or the Conservatives in order to win."

Again he had confirmed what she and the senator had divined. But she had one more question to spring on the mechanic before the interview was over.

"What about Alan Bart—the Liber-

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tarian? What are his chances?"

Kleinschmidt's round eyes widened and lit up. "That's one that I haven't spent a lot of time on. It's been a few years since the Libertarians were a major player in a presidential election. Let me see. . . ." After a pause and some furious keyboarding, he shook his head in puzzlement.

"It looks like he could be a real dark horse. He's got the potential to pick up a lot of small states and even pull down more votes than President Anderson. The way those little states split up gives the Libs a lot more leverage in a winner-take-all situation than most people realize. Yes, there's quite a few scenarios that could put him in a position to win the election—especially if he can get the support of the GOP in order to tie up a solid batch of electoral votes."

Jan felt the blood drain from her face as Kleinschmidt described her worst nightmare. At that moment, she decided that she wanted to have him on the campaign team—if only to use when the time came to help persuade Tyler where best to put his energies. Even if it meant giving up on space. After all, in politics there were no pure strategies.

Tyler embraced Gerry Kleinschmidt, his laptop, his statistical models, and his strategies so quickly that Jan wondered if he'd lost his judgment. Then she wondered if he'd already talked to Eddie Bligh.

The senator redeemed himself in her eyes, however, when he told Kleinschmidt where he disagreed with the mechanic's political models.

"Your numbers are good as far as they go," the senator said, his eyes wandering across the office to the view of the Smithsonian castle outside. "But voters are more than just numbers. You've got to do more than sort them and label them and poll them. You've got to see things from their point of view."

Kleinschmidt nodded vigorously. "Yes, sir. But that's where the marketing data helps. The more you know about people, the easier it is to see their point of view."

"But that's not what I said," Tyler replied, softening the rebuke with a smile. "I said you have to see things from their point of view. Your statistics and marketing numbers are the art of the objective. Politics is the art of the subjective. How do the voters feel? What gets them excited? What makes them afraid? You don't get that from peeking through their magazines subscriptions and reading their credit card receipts. That kind of approach gives you a campaign like Gold's. All style, no soul."

"If you feel that way, Senator, why do you want to use a mechanic in the first place?" Jan asked.

"Because I don't want to run a campaign that's all soul and no style," Tyler said. "It's going to be up to you to take care of that, Gerry."

Jan took a deep breath, reached out, and shook Kleinschmidt's hand. "Welcome aboard," she said.

"And it's going to be up to me to explain to the people why getting this country into the space development business is the most important thing we've ever done."

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Both Jan and Kleinschmidt shook their heads in surprise at that remark.

"Don't look so stunned," Tyler said. "Someone might think you weren't listening to what I said a minute ago. That's the flip side of seeing things from the other guy's point of view. If you're successful, it isn't that much more work to make him see things from yours."

Jan bit her tongue and let her boss have the last word.

The confusing thing about the Social Democrats is that they haven't quite decided who they want to be. They keep trying to get back into the main party. And the small states, the ones without a Social Dem organization, oblige them by letting them run in the primaries with the regulars.

I guess it boils down to a lot of Socials trying to do what President O'Brien did and run on both tickets.

What they don't seem to realize is that he did it the other way around—he started off in the main party and captured the new splinter group as an added prize. They keep trying to be the tail that wags the dog.

—Eddie Bligh, Satellite News Personalities, *August 3, 2011*

March 20

The long road to Tyler's Massachusetts victory ended in Boston, with a mad dash through Quincy Market, past chocolate chip cookies, clam chowder, souvlaki, egg rolls, lobsters, and hundreds of people stuffing their mouths. Jan had rushed breathlessly after the senator, the crowd threatening to pull her away from the tight flying wedge of campaign aides, reporters, and Secret Service agents. A small, red-faced woman had tried to keep pace with them, but fell behind, tears in her eyes, crying: "But you're ours! You belong to us!"

In the weeks after New Hampshire, Tyler had won some primaries and lost some others. They'd dragged the campaign from one end of the country to the other. And Jan had learned more from Gerry Kleinschmidt than she'd ever dreamed possible.

They'd won in South Carolina and Maine. Gerry was right about the newts and the Piedmont laborers. On primary night in Charleston, they waited for the returns in the new Hilton built in '09, after Hurricane Greta tore through the city, to look like an 18th century Georgian mansion. The numbers he predicted were right on the money—which surprised Jan more than the victory.

In Maine, he'd been less accurate in his predictions, though they still outpolled the others. Jan had spent a marvelous week overindulging in lobster and steamers along the coast, parading the senator past hard-luck fishermen and factory workers who made the New Hampshire voters look downright cheerful. She suspected there was something contrary in the voters from Down East that Kleinschmidt's computers couldn't quite quantify.

The next week they split the vote in Delaware. Gerry had called that one correctly and they hadn't wasted much time there. Tyler said it was a state where twelve-year-olds wanted to grow up and get their M.B.A.s, and

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it had no soul or spirit. He spent one miserable afternoon in the rain at the ferry terminal in Rehoboth handing out pamphlets—Jan figured he might influence a few New Jersey voters for later in the season—and they ran some ads on TV in Dover, hoping to spill over into the Philadelphia markets.

They lost in South Dakota. That was Social Democrat country. Them and the Farm Party. They left it to Vincetti and Samuels.

There were more mixed results in Colorado and Oregon, where Tyler won but split the vote with the governor and the Socials. The same was true in Arkansas, where he lost to Governor Gold.

Arkansas was the last of the small primaries and the end of the first phase of the campaign.

They'd done well in the little states where Tyler could talk to the voters face-to-face. That was the way the system had been set up back at the turn of the century. Close contact with the voters in cozy contests for the first phase. An opportunity for candidates without a long record or national stature to rise to the top.

It was also an opportunity for Jan to see how a software campaign could be more than just a mechanic's pipe dream.

The more she learned about fitting the numbers to the campaign strategy, and the more she learned about the issue leverage and demographic multipliers, the more confident she became about getting the voters to support Joe Tyler—with or without his pie-in-the-sky dreams about space.

The trick was to make an appeal on a variety of levels. Overlapping loyalties and interests were what made every speech and every advertising dollar count. Voters weren't just newts and office-drones. They were also suburban parents and urban condo-dwellers. The same people who worried about jobs for their kids worried about health care for their parents.

In each state, Gerry Kleinschmidt identified who those people were and where they lived. Then he projected a broad selection of strategies through his models. Some were successful, others weren't, and Jan based her campaign on the ones that worked.

Tyler was right. You had to see more than just the numbers. You weren't trying to manipulate people. You were trying to empathize with them, identify with them, and then show them a reason to support you.

Massachusetts was the first early decisive primary. In past elections it had narrowed the field by eliminating the Social Dems from the main race.

And it was big enough to give Tyler the national stature that he needed to go for the big industrial states.

Jan sent him to Worcester, Lowell, and Lawrence first—newt strongholds where they had the most support. Then she brought him down Route 128, hitting the high-tech strongholds of the last century. While Governor Gold was cranking up the old-style Boston political machine, Tyler was scouring the countryside looking for the neglected half of the party.

The biggest surprise came when

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they reached Northampton—a major academic center in the western part of the state and the last bastion of 20th century radicalism in New England. She'd expected a hard time—this was Social Democrat territory and Vincetti was popular around here. But the college kids from U Mass included large number of Space Cadets who'd helped out in New Hampshire. They turned out in battalions for the weekend rally on the football field, hanging on Tyler's every word, cheering loud enough to echo off the tall brown tower of the library in the center of the campus.

Tyler beat the Illinois governor by 11 percent and the two top Social Democrats barely made it into the game.

But Jan wasn't satisfied. The next piece of the campaign would be a lot tougher. The big states couldn't be won by charm, a handshake, and a half-hour discussion with two or three grandmothers in the local coffee shop. And neither could the country.

They were going to have to adjust their tactics—and maybe even their overall strategy. The senator would have to be told the harsh facts and would have to make some tough decisions—whether he wanted to or not. Jan knew there was a big fight coming. She just didn't know when it would come.

The candidates are going to tell you that this election is about saving the nation from the other guy, or building a bright tomorrow, or some other thing. They are probably right.

Because there are a lot of things that this election will not be about.

It will not be about the Jade Dragons, who now control the lower half of Manhattan. It will not be about farmers being forced off their land to clear the way for the Buffalo Barrens National Preserve. It will not be about the AIDS Survivors Network. It will not be about the kids who use and sell "fog." It will not be about a million other problems that face America.

Elections never are. . . .

—L. B. Smith, Two-Way Street, *January 11, 2012*

April 1

The big fight came less than two weeks later, in a hotel room in Chicago with a spectacular view of Lake Michigan. Jan looked at the lights of Gary, Indiana, off to the south, the crescent of a new Moon rising from the water, and the lights of a barge close by the shore. She looked at them, but did not seem them. She was just using them as an excuse not to meet the senator's eyes.

Tyler sat sour-faced and surly in a plastic-covered easy chair. He was not happy with her.

"One way or another, you have to knock out Governor Gold," she told him, putting a cap on a long lecture about where the campaign had gone wrong since Massachusetts. "This thing has gotten out of control, and you know it. The time has come to get back down to Earth. Senator Space Cadet worked well enough in the little states, but now it's time to get real."

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She was not exaggerating in the least.

Sometime in the last two weeks, the entire presidential campaign had lost contact with the planet Earth as they moved into the big midwestern states.

The issues had suddenly become things like Tyler's vote on aid to Namibia. Or Gold's position on funding for optical computer development. Meanwhile, the candidates on the right were slugging it out over such weighty points as Bryce William's suggestion, delivered off-the-cuff in an airport, that the nation return to the gold standard. A military think-tank's proposal to build orbital nuclear weapons gave everyone an opportunity to sound foolish without risking anything real. And creation of a retirement tax credit for corporate executives had done nothing for President Anderson but make him look out-of-date.

The Tyler campaign had been sticking with Kleinschmidt's numbers and trying to ignore the phony battle raging on the cable and in the newsmagazines. They were focusing their message on their voters and getting them to turn out at the polls.

But it wasn't enough. The polls showed them losing ground all around. And the political press was bashing them for failing to respond to the issues.

With four big contests on Tuesday and less than ten days until the vote in New York, Pennsylvania, and New Jersey, Jan was getting nervous. Illinois had been discounted from the beginning because of Gold's home field advantage—everyone expected him to win there by a wide margin. But Michigan was supposed to be Tyler's—boosted by the UAW and bankrolled by United Motors Corp. Only the latest polls showed Gold gaining on him. And that was why Jan had picked her fight with her boss now.

She'd never seen Tyler get mad before—not like this. She knew that the real reason behind the harsh words was the precarious position the campaign was in. All their work was at risk of being washed away by defeat. He cursed her out for five or ten minutes, accusing her of disloyalty, incompetence, and stubborn independence.

"You never believed in the program in the first place, we both know that. And all this time, you've done nothing but undermine everything I've tried to do."

"That's not true and you know it," she replied, wanting to speak softly and seriously, but spitting the words out with a harshness she'd never used with her boss before.

"Then what is your problem?" he shot back, fastening a sharp-eyed glare on her.

"Exactly what I said it was," she answered, calming herself quickly. "Your numbers are starting to fade and you've got to do something about it. That means something real, not just another inspiring speech about the future."

The senator looked away from her for a long time, staring silently out the window at the Moon. After a long silence he turned back to Jan, his face

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softened in its outlines, the harshness gone, but none of the spirit.

"Why can't you get as excited about this thing as I am?" he asked softly. "Am I really that wrong?"

She sighed. "No, not really, Senator. Maybe it's just me. I never could get worked up about things like that. God knows my father tried to make me. He was always preaching or lecturing about this cause or that one—hunger and homelessness, Bosnia or Kenya.

"But people my age don't feel the same way about things that your generation does. I was born after the Beatles broke up. By the time I got to college, Bob Dylan was a hoarse, mumbling has-been. Maybe we're too hard-edged. Maybe we're just different. But if you want to win, you've got to get our votes too—and that's what I'm worried about."

Tyler was silent for another long moment, then he stood up. "All right, Jan, I'll do something. Give me a few days to figure out just what, but if you want some reality, I'll give you some reality."

He smiled, gave her a perfunctory hug, then left for his room. An entire hour passed before Jan began to wonder just what he meant by his promise. And then she began to worry again.

Topic 331, Message 1271: Who's going to watch the candidates on HDTV tonight?

Topic 331, Message 1272: What? And miss the razorball playoffs?

Topic 331, Message 1273: Politics is more fun. You can't vote against the goalie on razorball.

Topic 331, Message 1274: And you can't send him an obscene message on-line either.

—Anonymous, Unregulated Computer BB, May 3, 2012

April 6

When Joe Tyler made good on his promise a few days later, it wasn't exactly what Jan had expected.

They had been in New York City for two days, battling a corps of local reporters who made the national press look like the faculty of Harvard in comparison. From what Jan could see, the Big Apple's tabloid-style news had been raised to a fine art—or perhaps lowered to a crude art was a better description.

The TV studio where they'd come today was cramped and crowded with piles of black boxes decorated with flashing graphics, a row of computers, and a forest of lights and microphones descending from the ceiling.

Tyler sat across a small desk from L.B. Smith, the host of "Two-Way Street," while Jan was stuck out in a production room, watching the interview both live and on Hi-D TV. The Hi-D screen was by far the more interesting—it was split between the image of the two men and a display of the combined responses of thousands of viewers.

"Tell me, Senator, are they still calling you a Space Cadet?" Smith asked. Jan winced—no matter what she did, they kept getting forced into situations where she couldn't control the questions.

At least this time she wasn't the

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only one offended by the question. The display to the right of the screen showed a sharp spike in negatives for Smith and a corresponding spike in positives for Tyler.

"They sure are, L.B. Only it isn't embarrassing anymore. I'm getting to be pretty proud of it."

Tyler's positives spiked again. Jan smiled, but didn't put much stock in it. A bunch of Brooklyn sofa roaches plugged into their interactive cables were representative of neither the state nor the nation. She remembered the lesson of the Liberty magazine phone survey in the '30s that showed the Republicans winning the election—the Republicans were the only ones who could afford telephones back then.

Tyler and Smith bantered back and forth for a few minutes, then the first message came across the screen—from Barbara N. in Astoria. "Why do you want to ruin other planets the way we ruined the Earth? God put those planets there for a purpose. You shouldn't take things without putting something back in their place."

"What do you think, Senator? Does Barbara have a point?"

Tyler smiled as Jan cringed. "It's hard to argue with logic like hers, L.B. I'm just as sad as she is about what we've done to our planet. But I think Barbara is right about one thing. The other planets were put there for a purpose—for us to use so that we can keep ours pure and clean."

The audience responded in Tyler's favor—although a strong minority came through for Barbara N.

Jan wanted to hide. Was the whole hour going to go like this?

"Senator, what about the platinum in the asteroids?" asked one of the online viewers. "Isn't there enough of the stuff to pay for whatever space program we want?"

A computer graphic showed attention levels increasing across the New York metro region. Jan was so involved in decoding the graphics that she didn't notice Tyler's response until he'd been talking for a minute.

"... My campaign manager has been after me to inject a bit more reality into the campaign, so I'm glad you asked me that question. You know, L.B., most of politics is about lies—what can we tell the voters to keep them happy? How much of the truth do we have to tell without getting ourselves in trouble? The rest of the truth gets trimmed off. So what's happened is that a lot of the leftovers have piled up down in Washington—mostly in the form of inside talk that never goes any further than the Beltway.

"But today, I'm going to let you in on one of your government's little secrets. Most people aren't aware of it, but there's trillions of dollars in precious metals out there in the asteroids waiting for us to go and grab it."

Jan sucked in her breath in disbelief. Was this what the senator had meant when he said he was going to put more reality into the campaign? He'd told her that he was going to do that today. If this was what he had in mind, she hoped she could find a way to recover. She looked around futilely, wondering if there was some way to stop Tyler from saying any-

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thing more—before he made himself the laughingstock of the campaign yet again. There was not.

"For nearly a year now, we politicians have been talking about what we will do if we're elected to make things better once again. Most of that has been just talk. Monetary and fiscal policy. Taxes and spending. Nothing that will make a bit of difference in anyone's real life.

"But space is different. There's vast wealth out there—unlimited energy, infinite resources, untapped power. All we have to do is decide that's what this country is going to do. Trillions of dollars worth of platinum sitting there for the taking—enough money to balance the budget, pay off the national debt, and finance a renaissance of American economic life. And just like gold drew settlers to the West, platinum can draw them into space.

"There is only one program on the table in this election that means growth for this country instead of managed decline. There is only one man running for president who wants to make that program a reality. With your help, with your vote, we can do that."

Jan's shoulders sagged. Maybe there was no one really listening. Maybe the tabloids wouldn't pick up on Tyler's "platinum in them there asteroids" revelation. Maybe a meteorite would hit the city and end all her problems right then. She looked at the clock—there was still more than half an hour to go before the show was over.

The next message came up from Tony B. in the Bronx.

"Senator Tyler—what do we do if we find aliens when we get to Mars?"

Jan groaned and went digging through her purse for another antacid. . . .

*News Net Bulletin * bc105-34*

$Summer Political Convention Schedule for on-line users for remainder of summer$

July 18-19—Farm Party, Lincoln NB, Fairgrounds

July 25-26—Conservative Party, San Diego Civic Center

July 31-Aug 2—Republican Party, Miami Convention Center

Aug 8—Green Party, Portland, OR, Oregon Health Sciences University

August 15-16—New World Alliance, Jackson, MS, State Fairgrounds and Coliseum

[*NOTE: Social Justice Front has not scheduled a convention as of this date.*]

—News Net, July 11, 2012

July 12

They won in New York, and then California, and again in Ohio a week later. And a month after that, at the convention in New York City, the nomination went to Tyler.

The whole thing took only two days. Back when party organizations were big and powerful, when politics happened on network television, the conventions were big media events, blotting out the competition on the airwaves, a massive civics lesson for the nation. Jan remembered them from her childhood, sitting up late with her father and watching the delegations from each state cast their

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votes.

This wasn't quite the same. The networks were long gone and the cable and satellite systems were practically invisible. The hall was quiet and subdued, without the acres of red, white, and blue bunting that marked earlier extravaganzas. The polling was done by computer—no more sonorous echoing reports from the floor. There were no demonstrations when the candidates were nominated. And when Tyler came up the winner, no balloons fell from the ceiling.

Jan knew that her father hated the drab ordeal that the nominating conventions had become. But with nine of the things scheduled for the summer, it was hard to get anyone in the press too excited over any of them.

President Anderson would get the same treatment in a few weeks. And less than a week ago, Governor Bart of Alaska had secured the nomination of the Libertarian Party in a one-night stand at a hotel in Wyoming. It only made her more nervous that he'd gotten as much media exposure from that event as Tyler had from his nomination here in the Big Apple. And probably as much as the president would get down in Miami.

Overall, however, she was relieved to put the first half of the campaign behind her.

The day after the convention, Tyler ended up in Maine for a week's vacation. Jan ended up in a hotel near Grand Central Station, sharing a room with Eddie Bligh.

"If you even mention the words 'politics' and 'bedfellows' in the same breath, I will boot your sorry butt right out of here," she warned him.

Eddie collapsed in a ragged looking easy chair in one corner of the room. He looked up at the water-stained ceiling and put a finger over his lips. "I wouldn't even think of it," he said. "Too trite, even for a press secretary. This place must have been quite a palace in its day."

"Yeah, but its day was a hundred years ago," she said, looking askance at the bathroom.

"It will serve, however," he said. "Especially for a couple of tired hacks like us."

"It reminds me of this campaign. And politics in general. We're in a sorry business, aren't we?"

"You sound awful disillusioned for someone who's just won the nomination for the next President of the United States."

"I don't have time for illusions," she said. "Let Joe and my father worry about them. That's what their generation is good for. Ideals and vast illusions about what we can do. They even believe in them. I wish I could, but I guess I was born too late."

Eddie cocked an eyebrow. "You're tired. You shouldn't let it get to you."

"I'm sorry, Eddie. It's just that people like you and I have to do all the dirty work for old men like the senator."

"And your father?"

"Well, he does his own dirty work. Or at least he has for the last fifteen years."

"Since you quit his paper?"

"I quit because I found out that newspapers can't get things done. By

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the time I found out that politicians couldn't either, it was too late to change careers again."

"And now what?"

"Now we get Joe Tyler into the White House and see if I'm just talking myself into a depression. Or if my father was right all along."

"I've got a better idea," Eddie said. "Let's get you into a hot bath and send down for a bottle of champagne."

"Eddie, you're so romantic."

"Not really, but I'll do until the real thing comes along."

"Sorry, kid. The real thing never comes along. After all, this is the twenty-first century."

When the GOP first split up, most of its members shifted allegiance to the Conservative and Libertarian parties. Few people wanted to be associated with those being blamed for the Crash.

But it wasn't long before many of the new Libertarians realized that their little party's leadership was long on principal and short on practical political experience. Within a few years, they returned to the old party or shifted to the Conservatives.

But the Libertarians benefited from the brief experience as a mainstream party. Many of their more extreme members drifted away, but those who remained adjusted their positions to retain the party's influence—and before long began winning elections.

—Tom Felden, Politics for a New Century, *New York, 2011*

October 22

The wind off Cook Inlet was raw and damp, tearing across the runways, cutting through Jan's thin jacket, and scraping against her face. With a week still left in October, here in Anchorage winter was already getting a head start.

"Tell me again what we're doing in Alaska," Eddie Bligh said as they hurried across the parking lot to the waiting electrovan. Their entourage was small, even considering the cost of air travel these days—just Jan, Eddie, a couple of advance staffers, and the senator. Tyler was already ahead of them, answering questions from the local reporters while the handful of national media traveling with them rushed for shelter indoors.

"It's something Gerry and I cooked up," Jan said. "A long shot. Lord knows we need it."

"Tell me about it. Do you suppose campaigns were this rough when there were only two parties?"

"Rougher," she said. "With just two candidates and four networks, there was no escape. The reporters were everywhere and everything you said got in the news every day."

"That sounds easier than getting hit from five directions at once."

"I guess it's just a matter of opinion," Jan said. "I like being able to catch my breath once in a while."

"I can accept that. But why catch your breath in Alaska?"

"It's what Gerry's numbers came up with. Ask him."

"I'm beginning to wish I'd never sicced him on you."

Jan flashed her most diabolical smile. "I told you I'd get even with you some day."

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They piled into the van, Eddie prying the senator away from the press, and swung around to pick up their luggage. Then it was a quick ride downtown to the train station where they transferred to the bullet train for the capital.

Jan fell into her seat, but couldn't really relax. She'd been running on adrenaline for days. Coffee wasn't enough anymore and she'd switched from antacid tablets to extra-strength liquids. She knew she should see a doctor about the burning in her gut, but she was afraid he'd tell her to take a couple of weeks off. There'd be time enough for that later.

They rolled through the city, block after low sprawling block streaming by between her and the snow-covered Chugach Mountains in the distance. They cut across the old Elmendorf Air Force Base, now studded with new-tech shops with alphabet names splashed across the walls —ABC Systems, XYZ Enterprises, LMNOP Associates—and past a new air freight and general aviation center, full of military surplus cargo planes and small aircraft with the home-built look of bush planes.

Just before they left the limits of the city, Jan was surprised by the sudden appearance of a bull moose, its antlers raised high, only a few feet from the tracks.

Eddie was right about getting hit from five directions at once. It took a lot out of her—and everyone else.

The Social Democrats were claiming that Tyler's space exploitation program would take money away from federal programs that were keeping people alive, arguing that the investment would be better used for public works programs here at home. Tony Vincetti was all over the TV with attack ads, narrowcasting at newts and other likely Tyler voters.

The New World Alliance candidates, Lincoln Smith of Atlanta, was parroting Vincetti, running fewer ads, but making lots of speeches.

President Anderson was touting a return to business tax exemptions and calling for an end to the Bureau of Industrial Coordination. He'd vetoed another bill that would have started a study of space resource exploitation—a minor proposal to do little more than compile existing data—claiming that he could do the same thing Tyler wanted to by unleashing the power of American business and industry and setting the market free.

Senator Bryce Williams, the conservative from California, sounded much the same. He called the space program another government boondoggle that would give too much power to Washington. At least he was better than the congressman from Mississippi who'd lost his bid for the party's nomination, but continued to rail on from his cablevision outlet. Little Tommy Little said that space was the domain of the angels where man should not intrude.

But at least they were all talking seriously about Tyler's platform. He had seized the high ground and anyone who wanted to take part in this contest had to get past him, one way or another.

And now Jan's worst fears about

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Bart were coming true. He was outpolling the president in a lot of the little states and threatening him in the big ones. Gerry's models showed a dozen different ways he could put together the votes to win a plurality in the electoral college.

So their only choice was to go after Bart on his own turf and try to pry some of his supporters away from him.

Kleinschmidt had told her there were two kinds of people who voted for Libertarians—Libertarians and the people who voted for them. Tyler could never win over the Libs themselves, but the people who voted for them were vulnerable.

Jan had argued for a week before Tyler would go along with her, though. Not a slugfest argument, like they'd had back in Chicago in March. Just a slow-burn guerilla action. Every day she had asked him if he'd made a decision on going to Alaska. Every day he would tell her that he had —and that he wasn't going. Not enough electoral votes. Not enough popular votes. And he wouldn't read the analysis memo that Gerry Kleinschmidt had written up showing the multiplier effect with newts and independents.

After a while, though, the message finally got through to him. "This business is more like a circus than ever before—with nine rings," he'd said. "I suppose going to Alaska makes more sense than putting my head into a lion's mouth."

They held the debate in the Assembly Chamber in the new state capitol. The smell of fresh paint and sawdust still hung in the air. After more than thirty years, Alaskans had finally moved the seat of their government up from the panhandle town of Juneau and closer to the state's center of gravity. The new building was a mix of varnished wood and chromed steel, frontier roughness and twenty-first century shine. The arching ceilings gave the feel of great northern sky, with eagles hovering near the horizon and the aurora flickering overhead.

And Governor Bart fit right in, with the sharp eyes of an eagle and the bulky energy of a Kodiak bear. And he was full of charm—making him as slippery as a salmon.

"Welcome to Alaska," he said as he clapped Tyler on the back and pumped his hand. "When this is over, you'll be staying around for dinner—we're having baked salmon and Matanuska strawberries. The salmon is as big as a horse and the strawberries are the size of apples."

Tyler charmed him right back. "You know, governor, the biggest regret of my young life is that I never made it to Alaska when I had the chance."

Jan usually squirmed inside at political schmoozing like this, but tonight it sounded genuine. It was probably something about the air up here, she thought. Maybe the northern lights did it.

A short while later, they joined the moderator, Dean Patterson of Alaska Pacific University, before a round table in the well of the Assembly Chamber, surrounded by videocams

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mounted on robot stands. After chatting for a few minutes they took their seats, the floor manager gave the signal, and the debate began.

But to Jan's dismay, there was no clash of political titans, no bluster and posturing, no charge and countercharge. It was more of a conversation between two men trying to make friends.

Once they got going and Bart outlined his standard call for deregulation, for government cutbacks, and for the laundry list of repeals that were the hallmark of his party, she expected Tyler to counterattack. When he did not, she was furious.

"I believe that the less power you give to government, the more power you give to people," the Alaskan said. "Who are you going to trust? Yourself? Or someone who doesn't know who you are, what you're doing, or why you're doing it?"

"You know, Governor, I wish I could argue with you on that, but I don't think we're that far apart. I think people should have the power and we shouldn't give it to something we call government. But you and I are both politicians and we both work in government. If we do everything you say we should, we'd work ourselves out of a job. It's always struck me as kind of ironic that the folks in your party work so hard to get into government just so they can get rid of it."

Bart grinned, then launched into a long history of libertarianism, digging all the way back to Thomas Jefferson.

"Jefferson was one of our guys," Tyler reminded him gently.

"Then you've got no excuse for turning your back on him," Bart replied.

Tyler laid out his own political philosophy in turn.

"Up until the last century or two, governments have always been a tool for the powerful to control the powerless," he said. "But power is a double-edged sword. And when the rules of democracy are obeyed, even the powerless can get their hands on that sword. Most of this nation's political struggles in the past fifty years have been over who controls that power—the people who work to build a better future for America every day or the people who want to use what they build for their own selfish ends."

Bart, not to be outdone, rebutted with an equally philosophical reply.

"It's the individual that matters most in this country—the free man and free woman working to create something out of the wilderness. Governments don't set goals and achieve greatness—individuals do. All that government can do is hold them back."

Tyler smiled. "Ordinarily, I might agree with you. But this race is for the one job where the individual counts the most. A president can make our government do exactly what you are talking about: set goals and see that they are accomplished. Otherwise, I don't think you'd be interested in it."

Jan felt heartened to see Bart smile at that. It was not a friendly smile, but the grin of a man who'd been momentarily bested in competition. The

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atmosphere grew more tense as the initial veneer of friendliness wore thin.

Now Bart took on Tyler's main force—the space proposal.

"That's an example of exactly what I'm talking about," he said. "You know, you've made a lot of inspiring speeches about space, but those are just words. What scares me is that the first thing you want to do is put the government in charge up there. And that's the last thing we should do. There's got to be room for people to do these things on their own. If we leave it up to the government, they'll never have the chance. That's been the problem for the past fifty years."

The knives were on the table now, Jan could see. Well good. This wasn't just a gentlemen's game. There was real power at stake here. And she knew just how important that was.

"Not at all, Alan," Tyler said. "I think there's got to be a place for your kind of individual spirit in all this. That's why I came to Alaska. I wanted to see for myself what a frontier really looks like. I wanted to get the feel of people living on the edge in a harsh environment. That's what the venture into space is going to be about.

"I want to be very careful that the machinery we use to make space our own is machinery that leaves us free to grow as individuals. I want to make sure that we don't become slaves to that machinery—either individually or as a society."

"Neither do I, Senator," Bart said. "But I'm not sure how you plan to accomplish that."

"To be honest, Governor, I'm not sure either. I'd be happy to listen if you have some suggestions that would help. But in the meantime, I think it's important to set that as our goal. You know, we've been talking all night about the things we believe, where we agree and where we disagree. I think we agree on more than we realize—we just come at it from different directions. You see the individual alone against the wilderness, where I see people struggling together to create something new. But take them one at a time or all together, people are still people.

"The thing I realized when I arrived here in Alaska is how big the world is and how small we are in comparison. Space is a pretty big place and it's mostly empty—not unlike your state.

Tyler's voice grew low and serious. "I think there's a great emptiness at the heart of the American spirit—not a barren emptiness, but a vastness full of potential. Like the wide open spaces of the Great Plains, or the Alaskan wilderness, or the high seas where our Yankee forebears sailed in wooden ships. Americans have lived with that emptiness for hundreds of years, felt it within themselves, each of them. We are a people who were made to live and work in space, who aren't afraid of the emptiness up there any more than we're afraid of the emptiness down here.

"Around here they used to say, 'North to the future.' Well I want America's future to be out among the stars—and I want the chance to make that future a reality."

Jan hadn't noticed when Tyler had

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turned his debating argument into a campaign speech, but that didn't matter. The Assembly Chamber fell silent when he was done and it was a long moment later that Dean Patterson reminded Governor Bart that it was his turn to respond.

But by then, it was too late. The debate went on for another forty minutes, but the moment of decision had passed. Jan knew that—and the sour mood at the dinner afterwards confirmed it. There was no question that Tyler had won the debate. And, Jan hoped, the election. . . .

The Miller Amendment did more than just take the vice-presidency out of the hands of the political parties by giving the office to the runner-up in the general election—although that was the reason it got the support it did. A string of embarrassing vice presidents leading up to Andrew Miller all but guaranteed its adoption.

But in the fine print, which didn't get the publicity that the rest of the amendment did, the Constitution was amended to give the electoral college even more power—by reducing the number of electoral votes needed to win the election from a majority to a plurality. The framers of the measure clearly did not trust the likely makeup of Congress with the political culture forming in the early years of the century.

The main benefit, however, was that media pollsters were no longer able to predict the winner of the election at 8:15 P.M. *based on returns from three precincts in New Hampshire, New York, and Virginia. . . .*

—Tom Felden, Politics for a New Century, *New York, 2011*

November 6

The campaign took a suite at the Washington Sheraton for election night. Every candidate was in town to watch the results—and to make their deals once the votes were in.

Jan was a mass of raw nerve endings, ready to jump at the slightest stimulus. Kleinschmidt's polling showed the same thing as the nationals. The race was too close to call in a number of crucial states that would be decisive—California, Illinois, Massachusetts, Virginia, Georgia.

And to make matters worse, the Social Democrats were sure to win enough states to make them critical to assembling an electoral-vote victory. What would Tony Vincetti demand in return for putting Tyler over the top?

The suite was jammed with too many people, overloading the air conditioning. Eddie was complaining that the windows wouldn't open, and the senator had retreated to the rear room. An empty coffee pot sat under a still-hot percolator and the room smelled of burnt drippings. A bank of HDTV sets at one end flashed with images, but remained silent for now.

Jan took a deep breath and plunged in, stroking the nervous campaign workers to build up their morale for the long night ahead. When she got to Eddie, she was the one who needed the bolstering.

"It's almost over," he said. "Tomorrow we can go back to our real lives."

"Is that an early return?"

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"I just call them like I see them."

"Have you passed your assessment on to Gerry Kleinschmidt?"

"Yes, but he doesn't want to hear about it. I'm only one voter. Statistically insignificant."

"So you voted after all."

"Yes. I almost forgot—not that it matters. D.C. always goes Social."

Jan just shook her head and went on into Tyler's room. He sat in a large easy chair in front of five TV sets, tuned to the four networks and the Satellite New Service. Three laptops sitting on a table in the corner were scrolling through the on-line news services.

Tyler looked up at her when she came in and smiled, then turned his attention to the televisions. He flipped the center set through to the cable service to watch pictures of voters filing through the polling places.

Jan was ready for the worst. Her maneuver against Bart had turned out to be more successful than she had anticipated. After the debate in Anchorage, his support faded like a snowdrift in the hot sun. But most of his voters had shifted over to the GOP and Conservatives. And that meant a potential disaster for Tyler.

Jan was still worried a few hours later when the results started coming in.

Tyler's home state was the first to report. Voting there had been completely computerized for more than ten years and the totals were ready a few minutes after eight.

The workers in the outer suite cheered loudly when Tyler was announced as the winner. Jan smiled, but knew better than to get excited. The night was just beginning and if the senator couldn't win his own state, they could all go home early.

A few minutes later, news that President Anderson had won in Massachusetts produced a round of groans and boos. Tyler laughed, dismissing the returns from both states. But Jan knew that he had to be concerned. Massachusetts was the first of the close states and if they all went Republican, the next few hours would not be easy.

Kleinschmidt arrived just before nine o'clock from the downtown office where he kept most of his equipment. He set up a display screen in the back of Tyler's room with a map of the United States and the vote tallies across the top. So far, only three states were filled in—one for Anderson and two for Tyler.

A few minutes later, results began to roll in from elsewhere in the East. New York was a solid victory for the senator, along with New Hampshire and Maine. But Anderson was the victor in Pennsylvania, New Jersey, and Maryland. Tyler picked up Florida and South Carolina. When he won in Alabama, Jan heard people in the outer room cheering for Huntsville and the space techs up there.

North Carolina and Texas went Conservative, bringing Senator Williams onto the board. "The more he wins, the better for us," Kleinschmidt said. "There's no way he's going to support Anderson."

"I hope you're right," Tyler said.

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Jan just gritted her teeth and watched as more returns came in.

They picked up Kentucky and Louisiana. Vincetti grabbed D.C. and West Virginia. Lincoln Smith won in Mississippi.

The Midwest was a disappointment. Anderson won in Illinois, Indiana, and Ohio. Tyler got Michigan, Iowa, and Minnesota. Wisconsin went for Vincetti.

Nebraska supported its governor and gave him its five electoral votes. The Dakotas went for Tyler—a surprise that Gerry explained as the effect of Social Democrats crossing the line to vote for the Farm party in South Dakota.

As the night wore on, the wave of returns continued west across the country. In the Rockies, Tyler won in Colorado, Montana, Utah, Idaho, and Nevada. Alan Bart finally joined the procession by winning in Wyoming. New Mexico went Conservative.

"It's happening just like I said it would," Kleinschmidt boasted. "The Conservatives and the Republicans are splitting the vote in enough states to give them to us."

"Yeah, but they're all the little states," Eddie Bligh noted. "We can't win without the big ones."

It was nearly midnight when the last of the big ones were in. Oregon went Green—a disappointment because Jan was sure that Tyler would have it.

Washington fell into the President Anderson's column.

And when California went with it, the suite fell silent.

Gerry Kleinschmidt punched in the numbers and everyone looked at the tallies. Jan could see the fear and disappointment in their faces.

President Anderson had 227 electoral votes. Tyler was trailing with 205. Conservative Senator Bryce Williams had won 53 votes, with Vincetti and the Social Democrats pulling down 20. Bringing up the rear were Smith, with 7 votes for the New World Alliance, the Greens with 6, and the Farm party with 5.

They still hadn't heard from Alaska and Hawaii, but Alaska was sure to go Libertarian with Governor Bart and no one doubted that Hawaii would go to Tyler.

The candidate himself broke the heavy silence with a loud and rousing voice. "All right, folks, it's not over yet. But I'll tell you, Eddie, if I'd known it might be used to make me vice president some day, I don't think I would have voted for the Miller Amendment when I had the chance."

Everyone laughed but Jan, who just sighed. She wished she didn't feel like Tyler was being deadly serious.

About 1 A.M., Jan and Eddie Bligh crossed the street behind the Sheraton and hustled into the elevators at the rear of the building. With them was Tony Vincetti, who had been staying at the Shoreham Americana, a block from Tyler's election-night headquarters.

They'd evaded the newsmen by sneaking out the back of the Shoreham and strolling up past the Lebanese embassy. The Secret Service hadn't been happy about it, but as long as they could follow along, they

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did nothing to stop the small parade.

The Secret Service led them through the service areas of the hotel, and a few minutes later they entered Tyler's room from a back hallway, bypassing the campaign staff in the outer room. Jan stood nervously in the corner as Vincetti shook hands with Tyler, then sat down and began to deal.

Vincetti didn't even bother with the amenities. He cut straight to the heart of things.

"I want Labor, Commerce, Health and Human Services, HUD, Education—and the Attorney General," he said.

Jan felt sick to her stomach. She knew this was how things were done these days, and she was no stranger to legislative wheeling and dealing. But what bothered her was Vincetti's brazenness, his lack of style or grace.

If Tyler felt the same way, he didn't show it. But he was prepared nevertheless.

"I'm surprised you're not asking for the whole damned cabinet, Tony," he said. The New York congressman smiled uncomfortably, hesitating instead of laughing. "You can't have HUD; I just got off the phone with Lincoln Smith and gave this one to him. It was all he wanted and I was happy to oblige. You, on the other hand, want the whole candy store. Well you can forget about the AG—this is going to be my government, not yours. And you can forget about Commerce and Education. I'll need them for my space program."

Vincetti's face sagged and the artificial smile gave way to an arrogant sneer. He started to rise. "Well if that's the way you feel about it, Senator, we'll just have to wait until next time to—"

"Sit down, Tony," Tyler said with a sharp authoritative voice. "If you think you can get a better deal with the Republicans, go right ahead. But don't think for a minute I'm going to let you walk out of here after screwing me, without making you pay the price. You'll be a dead man politically in any party if you give the election to the other side—and we both know it. I'm calling your bluff."

Jan held her breath as Vincetti hung in the air, half sitting, half standing. For a moment, she wished the old party system were still intact. This game of political chicken was too hard on the nerves.

Then Vincetti dropped back into his chair and all the air sighed out of him. "You won't reconsider Education?"

"Instead of Labor?"

Vincetti tilted his head back and forth and tapped his fingers on his knee in a show of mental calculation. "I'll stick with Labor—but I get to name deputies in every one of my departments."

"I wouldn't have it any other way," Tyler said as he reached out to shake Vincetti's hand and seal the deal.

Now the only thing to do was announce it. But Jan and Eddie wouldn't let them do that yet. Not until they had a better idea of where they stood.

"That gives us 232 votes, right Gerry?" Tyler asked.

Gerry nodded in agreement, but Jan held firm. "We don't go public

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until we know where Anderson stands."

Tyler came over and squeezed her arm. "You're right, Jan. We can wait a while longer."

"Senator, take a look at this," Eddie said just then. "Williams is coming on over at the Hilton."

The room fell quiet as they all turned their attention to the televisions. The leader of the Conservative Party squinted into the bright lights on all five screens, then announced: "Because of my deep sense of conscience and propriety, I can not support any of the other candidates and will not be releasing my electoral votes to them. Principle and honor come before political expediency."

Everyone in the room exhaled at once. Jan shook her head, wondering which was better—his proud display of futile principle or Vincetti's false posturing before caving in to Tyler.

A few minutes later, Anna Kowalchek, head of the Green Party, called the suite. Jan took the phone, passed it on to the senator, and watched him nod solemnly as he said, "That's all right, Anna. I understand your position."

He shook his head as he handed her back the phone. "We won't be getting her votes," he said.

The tension in the room began to build again as they waited for more news—and more votes. Within a few minutes, Nebraska Governor Elmer Bradley came on TV to throw his support behind President Anderson.

"That makes it 232 for Anderson," Gerry Kleinschmidt announced without joy. "We're tied at 232 each."

No one said a thing for a long time. Jan felt like crying.

"That leaves it in the hands of the Alaskans," Kleinschmidt said.

"Gentlemen, I think we should go down and make our announcement now," Tyler said, standing and reaching for his coat as Vincetti rallied beside him. Jan and Eddie followed. A few minutes later, they were all down in the ballroom in front of the bright TV lights.

It was more than an hour before they returned to the suite. And by then, Jan was ready to hand in her resignation from Senator Tyler's staff.

The big question about the election this morning is the same in every newsroom in Washington—where is Governor Alan Bart, the Libertarian candidate for president?

Since returns from Alaska came in at 1:43 A.M., *every reporter in the capital has been trying to track him down. The first one to find him is likely to get the scoop of the century. . . .*

—Tom Felden, News Net, November 7, 2012

November 7

"I'm not going to let you quit, Jan," Tyler said when she told him how she felt in the elevator on the way back up to the suite. "You didn't let me down. You did the best job you could. It would have been a lot worse if I'd done what you said and then lost. Maybe then you might have grounds to resign."

"But Joe, you don't understand. If I'd made sure that you did what I told

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you to, if I'd kept you from wasting your time in outer space, you might have won—"

Tyler narrowed his eyes and Jan swallowed her words.

"I might have won already, Jan. The night isn't over yet."

She wanted to argue with him, to tell him he was dreaming. Alaska had either gone Libertarian or Republican. Either way, it was enough to push Anderson over the edge. But the elevator doors opened before she had a chance to say anything more and the Secret Service agents hustled them down the hall.

Once back in the suite, she sat in the corner, trying to swallow her own disappointment. She was still there a few minutes later when a knock came at the back door of the room. She looked at Eddie Bligh and at Tyler, who all returned her puzzled stare.

The Secret Service agent who had remained posted in the room all night spoke into his lapel mike, then opened the door. A second agent stepped in an instant later, followed by Governor Bart.

"Sorry about the delay, Senator," he said. "But you folks back east here keep earlier hours than I'm used to."

Tyler was up and shaking the governor's hand in an instant. Jan felt her heart leap into her throat. What was Bart doing here? She couldn't dare to frame an answer.

"I just wanted to stop by and let you know that I won in Alaska. That gives me six votes to throw into the kitty. From what they tell me, it's all up to me. I won't keep you in suspense, Senator. I like your style. I like your courage. And I like it that you came all the way up to Alaska to steal my voters. I'm ready to give my votes to you if you want them."

"And what are you asking in return?" said Tyler.

"Just keep your promises, Senator. Keep your promises."

Tyler shook his hand again. "I guess that means we have to go back downstairs, Jan. Are you up to it? Or are you still planning to resign?"

Jan felt the room spin, her head buzz, and her heart pound. In an instant, she realized that she was wrong. Once in a while, men like Joe Tyler and her father were right. Once in a while, ideas and ideals meant something. Once in a while they made a difference. She was never so glad in her life to be wrong.

"I'll be right with you, Senator," she said. "Just give me a chance to catch my breath." ■

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THE REFERENCE LIBRARY Tom Easton

Glory Season, David Brin, Bantam, $22.95, 560 pp. (ISBN:0-553-07645-0).
The Wall at the Edge of the World, Jim Aikin, Ace, $4.99, 309 pp. (ISBN:0-441-87140-2).
Jaydium, Deborah Wheeler, DAW, $4.99, 352 pp. (ISBN:0-88677-556-6).
Warpath, Tony Daniel, TOR, $18.95, 318 pp. (ISBN:0-312-85282-7).
Dreams Underfoot, Charles de Lint, TOR, $22.95, 414 pp. (ISBN:0-312-85205-3).
Books on Disk

David Brin's first novels were enough to gain him an immediate position as a reliable craftsman of the field. He obviously respected and was willing to work with science fiction's traditions, but he was not a slave to them. He did not share the tendencies of some to avoid anything remotely resembling real science. He developed his own ideas instead of others'. He was not a conanist. And he built very high expectations in his readers—if he was not already committing wonders, he would do so very soon.

And Lo! His *Earth* (reviewed here in November 1990) fulfilled those expectations in every possible respect. It did not seem possible that he could top that one.

But he hadn't quit developing yet. For the proof, pick up a copy of **Glory Season**. You won't be disappointed.

Brin begins by sticking his neck out a country mile. His premise is a pastoral feminist world founded by idealists who engineered the genes of their followers to make parthenogenesis (self-cloning) a normal mode of reproduction. Yet he is a man, by definition—according to many feminists—incompetent to discuss such things. Surely he has a male agenda and plans to show how awful such a world must be.

Not so at all. One of the appealing features of SF is that in it authors and books carry on a continuing discussion of issues of lasting concern. The result can be a consensus vision of what interplanetary culture and technology must be like (to the point where stories that use that vision can seem quite hackneyed). The result can also be a to and fro of debate that adds an entirely new—and worthwhile—level of interest and significance to single works. Brin's debating

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opponent here is clearly Ursula K. Le Guin, whose *Left Hand of Darkness* (1969) has been—until now—the best known and best respected discussion of feminist idealism.

Brin's argument in the debate is colored by his nature as a very reasonable, sensible fellow with decent senses of biology (which tells us that parthenogenesis is a risky thing to rely on), sociology, and history. It's efficient, sure, but if the environment changes and the old model no longer works well, the species may die out. You need males to stir the genetic pot at least occasionally. (There's no guarantee that you will keep your genetic engineering skills forever.) Therefore, he gives his women two reproductive options, each one geared to cues drawn from the environment of Stratos. During summer, men are hot to trot, women are not, and mating produces kids of a familiar sort, normal genetic variants, or "vars." During winter, when a certain frost appears, women are hot, men are cool, and sex serves only to stimulate the parthenogenetic process. There follow some very logical consequences for the structure of Stratos's society, as well as a number of tensions between the var underclass and the clone middle and upper classes, between men and women, between radical feminists who wish to eliminate the old-fashioned and politically incorrect dependence on men and more sensible sorts, between those who wish to restructure society for more equality and those who wish to preserve the status quo. Naturally enough, those tensions flare into conflict when a man from the "Hominid Phylum" (a name chosen to reflect the evolution of humanity into a myriad species) arrives to say the folks back home are about to get in touch again.

The tale begins with two var girls, twins, Maia and Leie. They are just barely grown, and the time has come for the clone family that birthed them to kick them out to sink or swim. Soon they are separated, and Maia must continue, encountering the various aspects of her society, running afoul of fanatics, being imprisoned in quite a Rapunzoid tower, and discovering that Renna, the man from the stars, is also a prisoner. There is escape, flight, treason, capture by new fanatics, the discovery that the Stratos experiment has gone on for millennia, far longer than the ordinary citizen suspects, and that the past has had upheavals, periods of male dominance and male-female equality, times of gloriously high technology, and finally. . . .

The book is far too large and complex to describe in detail. Suffice it to say that there is violence and death, pursuit and discovery, betrayal and maturation, immense enjoyment and final satisfaction, all in the service of a thoughtful approach to the question of intergender relations that I find far more convincing than Le Guin's book.

I can hardly wait to see what Brin will do next.

According to his latest novel, **The Wall at the Edge of the World**, Jim Aikin would like to find an answer to

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the cruelties that people inflict upon one another. I imagine him mulling the problem, thinking that if only people could share each other's feelings and thoughts, they could not bear to cause pain. That is, if they were telepathic, telempathic, if they could take over the world and design a society around their talent, if there were no "nulls" around to complicate the picture, if... But wait, he must have thought, how could they possibly take over the world?

In due time he reveals that his telepaths arose not long after our present, infiltrated the power structure, and destroyed all—or almost all—those who did not share their talent. When children now fail to mature into the talent, they are Cleansed, or executed. Empathy fails for all those who lack—for whatever reason—the one feature that defines a "truly human" being. A society of tranquillity and plenty, the "One," is built on blood and ruled by those whose powerful minds allow them to shape the thoughts of others.

So far, what he came up with does not sound very fresh and startling. Indeed, the book's beginning must strike many a reader as drab, uninspiring, worn thin by the hands of many other writers. Yet Aikin turns out to be a superlative writer who has achieved something of wondrous vigor, color, and depth from that beginning.

Meet Danlo Ree whose beloved wife fell away from the One, lost her ability to share thoughts, was declared a null, and was executed. His grief has been smoothed away, but not quite successfully. He has a stubborn, sturdy core that draws him to watch more Cleansings, each of which strengthens his memories. He also has a talent for dissembling, even to the powerful telepaths who rule the One.

Now see the wall of the title. It was built around the settled portion of the world to remind that if the human population grows too large, the telepathic "One" will split and war may come again.

Now meet the wild women who have trekked from what were once the Louisiana bayous. They are all nulls, remnants of the people whom the telepaths destroyed centuries ago. Now their men are dying, and they think that if only they can steal a few men from some other tribe, the gods will leave their own men alone. Unfortunately, they have found no men at all, no people at all. The world is barren—until they come to the wall, peek over, and spot the placid folk of the One. Soon they are raiding, leading men to a corral in the hills, Danlo Ree among them. The men find them filthy, baffling, appalling. Yet they know the One will find them through the telepathic linkage, even though rescue will not come until a few of the men have been treated most horribly.

After the slaughter of the wild women, Danlo Ree finds himself alone in the hills. He discovers Linnie, a single surviving wild woman, filthy, savage, unable to speak properly, yet also strangely enticing: she is a null, she knows how to survive beyond the wall, and he now can see a mission for

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himself—to rescue nulls before they can be Cleansed, so set up a community beyond the wall, to relearn the secrets of nontelepathic society. However, it soon becomes clear that the One still recalls how to hunt down nulls. Danlo Ree must somehow find allies, rescue his first few nulls, and devise a way to be safe from air raids and bombs. When he learns that a few more wild women are held captive in the Jewel (the capitol building of his society), when Linnie is captured and taken to the same place, he must attack the very heart of his society and confront the moral and ethical contradiction at its root.

You should not make the mistake of expecting an entirely happy outcome, at least in conventional terms, but I will say no more for fear of spoiling your enjoyment.

According to Deborah Wheeler, jaydium is a marvelous substance found lining twisting tunnels in the mountains of the desert world of Stayman. Among other things, jaydium makes possible economical faster-than-light travel. It was its discovery that made both the human Federation and interstellar war feasible. The threat of the latter drove the father of Kithri Bloodyluck to flee Albion for Stayman. There he continued his scientific researches, grew ill, and died, while his daughter became a jaydium miner and slowly went nuts for lack of funds to leave the world she considers hell.

This is where Wheeler's **Jaydium** begins. Enter Eril, a misfit starship pilot who needs a skilled partner in order to qualify as a courier. His sister's husband—an ex-jaydium miner—has told him of Kithri and her immense skills. Now he has come to check her out, but though he persuades her easily enough to fly with him on a jaydium expedition, things very quickly go very wrong.

A ghost appears in the tunnel they are mining. A blow with a "force whip" promptly materializes the ghost as an antique spaceman, Lennart. When they leave the tunnel, the desert is forest. When they return to where the town should be, there are beautiful, crystalline, alien ruins and a human scientist, Brianna, who soon makes it clear that they have transferred to a parallel reality in which Stayman has no jaydium but two other worlds do. Space pirates appear, and after suitable commotion, the force whip strikes again, sending the human quartet to a time when Stayman was inhabited by human-sized mollusks who secrete a crystalline, shell-like material with which to make buildings and line tunnels. These beings face war with two colony worlds. The humans must struggle to understand and be understood, to stay out of specimen cages, to come to terms with each other, to promote peace, and finally to get home again.

I won't tell you whether they succeed or not. The story deserves to be called humdrum and is clichéd enough to make the end predictable, and Wheeler's hand is often awkward and simplistic. Yet there is an emphasis on the quest for peace that is unusual when so many novels focus on

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the quest for dominance and victory, even though Wheeler does display deep cynicism about the impenetrability of folly. In other words, something of value shines through. Perhaps in some future novel Wheeler will unveil that something fully.

In 1960 when Poul Anderson had English knights lick a bunch of blue-skinned aliens and hie off on a *High Crusade* to the stars, we all had grand fun even though we knew perfectly well it was a crock. I'm sure we also thought no one else could ever possibly have the nerve to do such a thing again.

We were wrong, of course. If a thing is worth doing, it is worth doing over. Or overdoing. Or something like that. Unfortunately, no one has yet managed to repeat the humor that made Anderson's book such fun. The imitators all seem to think the point is violence.

Tony Daniel apparently thinks so too, though his first novel, **Warpath**, has a great many strengths going for it. His chosen primitives are American Indians who, he says, discovered a mental trick that allows them to paddle birchbark canoes into space and travel faster than light to other worlds. When modern humans finally get the hang of FTL travel, they find the Injuns got there first. A bit of a shock, that, and the result is side-by-side villages that look rather as if they had been lifted from the American frontier. There are tensions, some rooted in sheer jealousy, some in the Indian possession of the only Loosa clay deposits in the known galaxy.

Loosa clay is important because modern human civilization uses partially sentient copies of human personalities, or algorithms, to run all sorts of machinery, including the weather. Illegal copies, or "rhythm," are used as drugs. And both legal and illegal algorithms can be maintained in a fistful of chemically complex Loosa clay.

So can the chocalacas, creatures or algorithms or somethings that form symbiotic relationships with those canoe-paddling Indians—Wanderers—who carry news and commerce among the worlds and help them achieve speeds much faster than anything a modern spaceship can match.

As the story opens, Will James, owner of the local paper, is meeting an old friend, the half-breed Wanderer Thomas Fall, on his return to the cold world of Candle. They are waylaid by thugs who smash Thomas's Loosa vehicle for his bear-like chocalaca Raej, and steal the rhythm he has brought for Janey, old friend, perhaps lover, utterly dependent on such assistance to maintain her grip on the familiar world.

Immediately there is the threat of war, the revelation of plots by a Church based on the Marxist social-justice heresy out of Central America, by power groups back on Earth, even by whatever it is that lies behind the chocalacas. Against these plots play the pasts of Will James (he is a "transmission," reconstructed from a radio signal; his true love, who didn't make it whole, runs Candle's weather), Janey (a half-breed of a very different

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sort), and Thomas Fall. We learn something about the nature of the Universe. And in the end we are filled with something like a sense of wonder.

It's a good tale, inventive and energetic and in some ways quite daring. Yet I don't think it is quite as good as its blurbs would have you believe, for it is more than a little uneven in its pacing, the central character often feels quite strained, and I found it virtually impossible to suspend my disbelief of Daniel's basic premise.

Charles de Lint is well known for his melding of myth with the urban environment, often to quite powerful effect. **Dreams Underfoot** collects nineteen of his stories, including "Our Lady of the Harbour" (reviewed here in the July 1992 issue), and serves as a very nice survey of his work. Two stories, "Small Deaths" and "In the House of My Enemy" (a nice handling of abuse), appear for the first time. The rest first appeared in scattered magazines and anthologies.

Rather than comment on the individual stories, perhaps I should address a justification one often hears in connection with urban fantasy: human beings need myths, and the best, most powerful, most resonant myths for modern humans are ancient myths translated into modern terms. Therefore, it is high literary art and service to humanity to write stories about street-wise elves and unicorns that eat out of garbage cans.

This is not to say that this approach—or a rather less jaundiced expression of it—cannot produce some very good stories. Charles de Lint has proven again and again that it can.

Nor is it to say that the best, most powerful, most resonant stories of the modern age do not seem to reflect or embody ancient myths. After all, those ancient myths have survived the millennia precisely because they do indeed speak to the fundamental concerns.

On the other hand, it would be difficult to look at any modern story and say it has no kinship at all to some ancient myth. After all, there are so many of those myths, and interpretation is a very powerful filter. Ask yourself how many classic SF stories bear no relationship to the Prometheus myth, how many love stories fail to echo those of Hero and Leander or Damon and Pythias, how many adventurous quests are not kin to the Odyssey.

The weakness of urban (and other) fantasy is not that it tries to bring old myths to modern life, but that in the effort it proves too slavish an imitator. This can be true even of a writer as impressive as de Lint, a thought that I come to reluctantly precisely because he is so impressive.

Is there an alternative? We can't escape the kinship of myth and modernity, for there are a finite number of plots. But we can strive to identify parallels in old and new worldviews. For instance, magic was once how people thought to

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understand and control the world. Its equivalent today is science and technology, which work rather better. The old watchword was divine supremacy, faith, belief. The new is self-reliance, skepticism, objectivity—you don't need to believe in a computer in order to use it.

If you protest that many people still knock on wood, cross their fingers, and pray, I answer that precious few still leave a saucer of milk on the doorstep for the browny. Even fewer hire a wizard to tell them where in the backyard they buried the Mason jar full of silver dollars; they buy a metal detector instead.

Stories that recognize the equivalence (as worldviews) of science and technology with magic are a truer modern equivalent of ancient myths and fairy tales than any street-elf, wizard-ridden fantasy. Stories that fail to recognize this equivalence—no matter how beautifully and powerfully they are written—necessarily smell a bit musty and quaint. We could even say that their writers and fans seem a bit out of touch with reality.

Of course, this is a technophilic attitude expressed in a rivet-happy magazine for a bunch of readers whose brains are built out of gears and vacuum tubes. We're hopeless, aren't we?

BOOKS ON DISK

The Disktop Publishing Association has changed its name to the Digital Publishing Association in an effort to avoid confusion with (and any connotations of amateurishness that may be attached to) "desk-top" publishing.

Is the effort justified? Or is it just one more example of trying to improve an unfortunate image by changing the name?

Well, consider.... The eleventh issue of John Galuszka's *Electronic Publishing Forum* (available from Serendipity Systems, P. O. Box 140, San Simeon, CA 93452, for $9.32) makes me feel that electronic or disk-top or digital publishing is really getting someplace now. For one thing, EPF #11 concentrates on reviews of digital products, and without limiting itself to praise; the field has desperately needed this sort of evaluative attention for some time. For another, it includes copies of Pinnacle Software's shareware SEE utilities, which seem very likely to live up to their billing as useful tools for those interested in doing their own digital publishing. Among other things, they permit one to set up efficient, attractive menus or tables of contents. You can obtain these utilities from Pinnacle Software, Head office: CP 386, Mont Royal, Quebec, Canada H3P 3C6; U.S. branch: Box 714, Airport Rd, Swanton, Vermont 05488; you can also send Email to T.CAMPBELLll on GEnie.

There is also a copy of *Garlic Magic*, an electronic book on a certain magical herb with a somewhat breathless initial tone, entertaining graphics, and a surprising amount of lore, myth, history, recipes, gardening tips, and more (including

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too many typos). Finally, there is a copy of the first issue of the electronic magazine *Overbyte*, which plans to give each subscriber coverage of only those topic areas—movies, TV, crime, politics, fiction, nonfiction, even book reviews—he or she requests and offers a quality of prose that is quite astonishing to anyone who knows what is generally met on the digital publishing scene. Both book and magazine make very good use of their respective display engines and amount to fine demonstrations of what digital publishing can be.

With all the extras it offers, EPF #11 has to be rated a very good buy.

Reader Michael W. Bell sent me the demo disk for ACCESS Publishers (1078 East Otero Avenue, Littleton, CO 80122). This is a set of ten samples from novels offered on disk, using a front-end reader interface that works quite nicely and simply (though it is a bit more awkward than necessary). The novels themselves (*Callie*, by Donald J. Zook; *Deadly Secrets*, by Michael J. DeSario; *Endeavour's Travels*, by Kathryn Wicker; *Firewalkers*, by Everett Rockwood; *Milky Way Rehab*, by Ralph Metzner; *Preemie*, by Fran Richards; *Project First Step*, by Steve Catoe; *Saint Anthony's Fire*, by Maxine Hillis; *Snackers*, by Dani Christian; and *Year of the Crystal*, by Marilyn O'Sullivan) include SF, SF spoof, borderline SF, mystery, and romance. All strike me as derivative and amateurish, although having said that I must also say that I have seen much worse. In fact, I have seen worse on the stands.

If you wish to see what I'm talking about, the demo disk (MS-DOS only) has no price tag—but don't jump to conclusions. Write and say you're interested. They'll either send a disk or tell you how much money to send them.

Jim Henry III (whom I mentioned some time back) has also sent a disk, showing the work he has put into typing onto disk public-domain classics such as works by Lord Dunsany, Hope Mirrlees, G. K. Chesterton, Rudyard Kipling, Leo Tolstoy, and Lewis Carroll. The presentation is not fancy, for he uses a simple reader interface, but there seem to be remarkably few typos. That is, he has chosen well and executed well. If he can also market well, he should find the recompense he deserves.

The Dunsany material includes twenty-six fantasy stories and three plays on one disk priced at $5. The Mirrlees novel, also $5, is *Lud-in-the-Mist*, first published in 1926 and long out of print. The Kipling material includes the "Just So Stories" and "Oak and Ash" and is packaged with Chesterton's "The Babe Unborn," Tolstoy's "Tale of Ivan the Fool," and Carroll's "Hunting of the Snark" and "What the Tortoise Said to Achilles," also a $5 disk. To order, write Jim Henry III, 405 Gardner Road, Stockbridge, GA 30281-1515. ■

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BRASS TACKS

Dear Stanley Schmidt & Company,

An editor deserves to know when he is doing something right. I'd like to add my perspective to the ongoing discussion in Brass Tacks as to whether or not *Analog* disparages religious belief.

I first encountered Lois McMaster Bujold in the pages of *Analog,* in her serialized novel *Falling Free.* I saw it as being in some degree a paradigm of the story of Moses and the Exodus. Apparently Bujold saw it too, for at one point she actually uses the phrase "Let me tell you of the Promised Land." My first encounter with her hero, Miles Vorkosigan, was also in *Analog,* in "The Mountains of Mourning" and soon after in "Labyrinth"; stories that, in very different ways, affirmed the value of the individual, including the "different" individuals (One would say "handicapped," except that with Bujold they are *not* handicapped!).

I am on the staff of the Warren/Trumbull County (Ohio) Public Library, with special responsibility for the selection of books for teens; I am also a member of The Church & Synagogue Library Association. Each summer, since 1987, I have spoken at their yearly convention about new books, whether explicitly devout or not, that reinforce the higher values that our faiths try to protect. I began my presentation that year with the words, "I have a new discovery to share with you." I told them of Bujold and of the magazine where I had found her.

Since then, I have read more of Bujold; I was moved by the prayer for her tormentor that Cordelia prays in *Shards of Honor* (and releases him from his bondage). I was unsurprised to read in *Brothers in Arms* that Miles attributes his ideals more to his mother's theology than to his father's politics—though, at bottom, they come to the same point. I still don't know precisely what Cordelia's faith is (or, what Bujold's is) but I know it has influenced her, and all she encounters.

My yearly booklist for the Church and Synagogue Library Association has now been expanded into a book-length guide titled *Books for Teens: Stressing The Higher Values.* As part of that guide, I include essays of literary analysis on four contemporary writers for teens and adults: two explicitly devout (Madeleine L'Engle and Walter Wangerin) and two in which the higher values of faith are expressed in a secular framework

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(Cynthia Voigt and Lois McMaster Bujold).

Thank you, Dr. Schmidt, and the rest of the *Analog* staff.

EDITH S. TYSON

Warren, OH

Dear Editor:

Please continue stories with religious allusions and metaphors, no matter whose ox is gored. Religion is part of many scholars' definition of human and so should be a legitimate target or background for speculative fiction. I have little sympathy for the position of Robert G. Werner in the March '93 issue.

However, I have wondered why there were no gibes in Brass Tacks about your book reviewer's wide miss on Orson Scott Card and *The Memory of Earth.* This book is clearly based on the beginning of *The Book of Mormon,* not Exodus. The killing of Laban is plainly discussed in Card's book. This death is far more interesting as a moral problem than the Egyptian slain by Moses. Card also uses the conflict between Nephi and his brothers while Moses has little dealings with his blood family. The parallels go on indefinitely. I don't understand how Tom Easton read Moses as the archetype, when Card himself has given wide publicity to the pervasive influence of the Mormon mythos in his writing.

Thanks for your excellent work.

RONALD BALDWIN, PASTOR

Wilmington, DE

Dear Mr. Schmidt:

Your comments about the incident that prompted you to write your editorial, "Inappropriate Technology" (March '93) are very, even ironically, to the point.

The inventor of virtual reality, the ultimate computer simulation, got his major financial backing in Japan, not here (a shameful, symptomatic bit of US shortsightedness that merits comment, and may shed light on the reasons for the atrophy in the US space program). Ironically, one of the first practical applications of virtual reality is in a Tokyo department store today. A person in the market for a new, or completely redesigned kitchen can walk in, don the head gear and gloves and walk through his new "kitchen," reach out and open cabinet doors, move the sink, adjust the heights and depths, anything, and get the feel of the resulting design. The final design is instantly converted to blueprints and plans, and the customized kitchen is built.

As you say, the simulation is ultimately inadequate as an end in itself. Students using simulations instead of real kitchens or wood shops, won't be adequately prepared. In the same way, imagine how helpless the customer in the Tokyo store would be if the store delivered his kitchen on a floppy disk.

A techno-junkie does not have an easy addiction to deal with. It's not simply a matter of saying "No." The trick is in knowing *when* to say "Yes."

Of course, being an *Analog* junkie is easy. Just say "Yes."

Thanks for feeding our good habit.

JOHN VESTER

Rancho Cordova, CA

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* * *

Dr. Schmidt,

Your editorial concerning "Inappropriate Technology" was very good and to the point. I enjoyed it, and for once did not want to argue with you. I would like to point up one incidence of "appropriate" vs "inappropriate" technology.

Like you, I maintain a hand-written address book, which I carry in my wallet. However, I do not have the problem of scratching out addresses until I run out of spaces, requiring a new book. Instead I use an "appropriate" technological writing instrument called a "pencil," instead of an "inappropriate" "ball point pen." When the need arises to change an address, I merely use the other end of my pencil, which has an amazing rubber device called an "eraser." This "eraser" rubbed over the writing removes it and permits me to turn the "pencil" over and write in the new address. I believe this illustrates the point you were trying to make.

JIM WALTON

Huachuca City, AZ

Well, yes, and if you're satisfied with pencil in your address book, fine. Personally, I've never found a paper-pencil-and-eraser combination that didn't get pretty messy if I did very much—and the method doesn't lend itself very well to keeping the addresses in a logical, easy-to-find order.

Dear Dr. Schmidt:

I am writing in response to "The Most Important CD-ROMs in the World" (Alternate View, March 1993).

Thomas Edison may deserve credit for the idea that information can be bought and sold like any other item of commerce, but the discovery that information can be of great value is not his. The penultimate sentence in the column, for instance ("Information is power!"), is very like an expression known in the Roman Empire, which preceded Thomas Edison.

Rating information by its commercial value may assign but little worth to historical data. This could aggravate the problems with it caused by a changing information technology, described in "Continuity" (*Analog*, editorial, August 1991).

Take, as an example, CD-ROMs. Will they hold their information for several centuries? Mr. Stine is willing to abandon his discs by the next time he moves. After several centuries, neither his progeny nor anyone else may care to answer the question.

OK, say it won't matter, CD-ROMs will be replaced by something even better, so the data will survive. Say also that our technology keeps pace with all the new information we produce. The question becomes: will anyone read what is now on Mr. Stine's CD-ROMs, whatever its form?

That depends. Technology gets information from person to person, and lets us manipulate it. Getting it into and through the wetware is a different problem. A bad attitude toward history, and the data go unread. Furthermore, human limitations may already have created a bottleneck in the flow of information. We may have to slow the flow to allow time for pursuits like ancient history.

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We might, however, "link directly with the system" to remove the obstruction. If we do so, then not just the world, but the human race "as we know it" will cease to exist. Information will no longer be a commercial item, but more like the air we breathe. An interesting prospect, but is that what a "technological humanist" really wants?

KURT FOSTER

Colorado Springs, CO

Dear Mr. Schmidt;

I've just finished reading "Inappropriate Technology" and G. Harry Stine's essay in the March issue. I must admit I haven't purchased a CD-ROM reader myself although I use them regularly at the public library since the card catalogue has been on CD-ROM for a number of years. In fact, my wife and I helped create the catalogue along with several hundred other volunteers.

One of the problems with the CD-ROM revolution from my point of view involves the inevitable editing. The old catalogue listed more than a dozen different editions of *Alice in Wonderland* for example. About half had the Sir John Tenniel illustrations. Most of the rest were the Disney artwork and one had Lewis Carroll's own illustrations. Carroll was a fine graphic artist, by the way. His illustrations are pictures of the children he wrote the book for. Tenniel's are hilariously funny caricatures of people like Queen Anne. They add an element of satire which Disney missed completely. On the new CD-ROM catalogue all the editions are listed under one entry and the illustrator is ignored. The library user ends up accepting pot luck.

On the other hand, CD-ROMs require much less storage space and are capable of storing just about anything from text to videos. Assuming the consumers demand readers which will play back anything, the libraries

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could eventually get more storage space and a single multi-media format.

I've spent thousands of hours combing the stacks of libraries over the last forty years, reading whatever struck my fancy. I don't know how often I've checked out books which haven't been checked out in twenty years or more, but it is often enough to cause comment among the staff of every library I've ever used. Far too often libraries are forced to discard books simply because they don't have room. Each time that happens part of the database available to the public is lost. Research becomes more difficult and less accurate in my opinion.

I really enjoy the discussion which *Analog* has been carrying for the last few years. Please keep it up.

JAMES C. RITTER, JR.

Montrose, MI

Dear Mr. Schmidt:

I enjoyed reading your editorial, "The Manuscript That Never Was" (February 1993).

I would like to comment on your statement, "The only way they'll [the authors] be persuaded to do that extra work is if they can be convinced that the manuscript market itself is financially rewarding enough to make it worthwhile." It is true that the manuscript market for science fiction, fantasy, and horror is not as strong as other areas of fiction, but the sale of manuscripts can still be a substantial bonus to the author. In the case of the very top authors like King or Rice, this can amount to thousands of dollars. Since no one can tell where the next King or Rice will come from, I tell all beginning authors to save their manuscripts. King, early on in his career, gave the manuscript for his first published novel to a charity auction; it did a few hundred dollars. Today that same manuscript would be more like $30,000 or $40,000. Not bad for a pile of old used paper.

BARRY R. LEVIN

Santa Monica, CA ■

One should respect public opinion insofar as is necessary to avoid starvation and keep out of prison; but anything that goes beyond this is voluntary submission to an unnecessary tyranny.

Bertrand Russell

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UPCOMING EVENTS Anthony Lewis

28-31 October
WORLD FANTASY CONVENTION '93 at Radisson South, Bloomington, Minn. Guests of Honor: Poul Anderson, Roger Zelazny, John Crowley; Artist Guest of Honor: Tom Canty, TM: Neil Gaiman. Registration: $75 attending, $40 supporting; limited to 1000 members. Info: World Fantasy Convention, Box 2128, Loop Station, Minneapolis MN 55408.

12-14 November
PHILCON '93 (Philadelphia SF conference) at Adam's Mark Hotel, Philadelphia, Penna. Principal Speaker: Fred Saberhagen; Guest Artist: David A. Cherry; Special Guests: Emma Bull and Ian Watson. Registration: $30 until 1 November, $35 thereafter and at the door. Info: Philcon '93, Box 8303, 30th Street Station, Philadelphia PA 19101. (215) 342-1672). r.kabakjian (GEnie)

26-28 November
LOSCON 20 (Los Angeles area SF conference) at Airport Hilton, Burbank, Calif. Guest of Honor: Roger Zelazny, Fan Guest of Honor: Paul Turner. Registration: $25. Info: Los Angeles Science Fantasy Society, Inc., 11513 Burbank Blvd. North Hollywood CA 91601.

1-5 September 1994
CONADIAN (52nd World Science Fiction Convention) at Convention Centre, Winnipeg, Manitoba. Guest of Honour—Anne McCaffrey; Artist Guest of Honour—George Barr; Fan Guest of Honour—Robert Runté. Registration—$85 (C$95) adult, $30 (C$35) child until 30 September 1993, Supporting—$25 (C$30). This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Conadian, Box 2430, Winnipeg MB R3C 4A7 Canada or Box 7111, Fargo ND 58109 (204) 942-9494; FAX (204) 942-3427.

You can send me e-mail about your convention—A.LEWIS20 on the GEnie™ network. When calling conventions for information—do not call collect. ■

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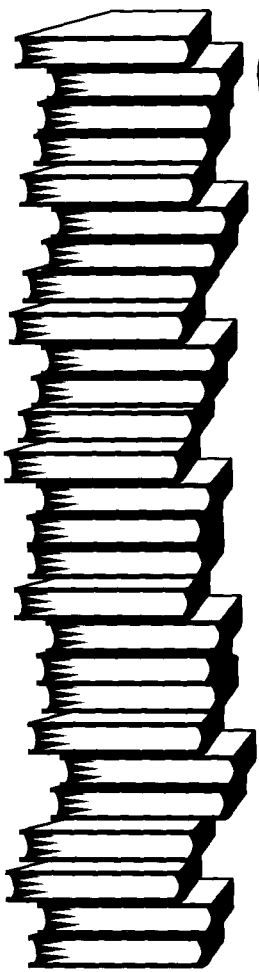

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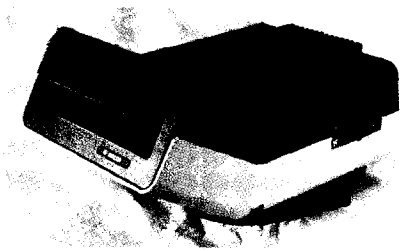

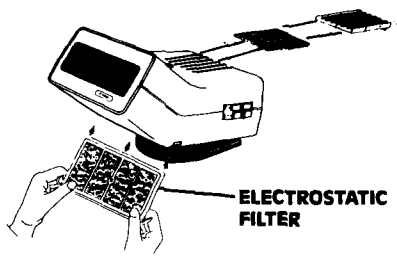

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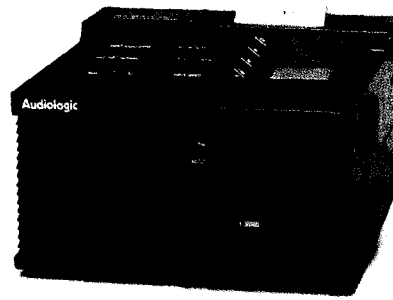

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